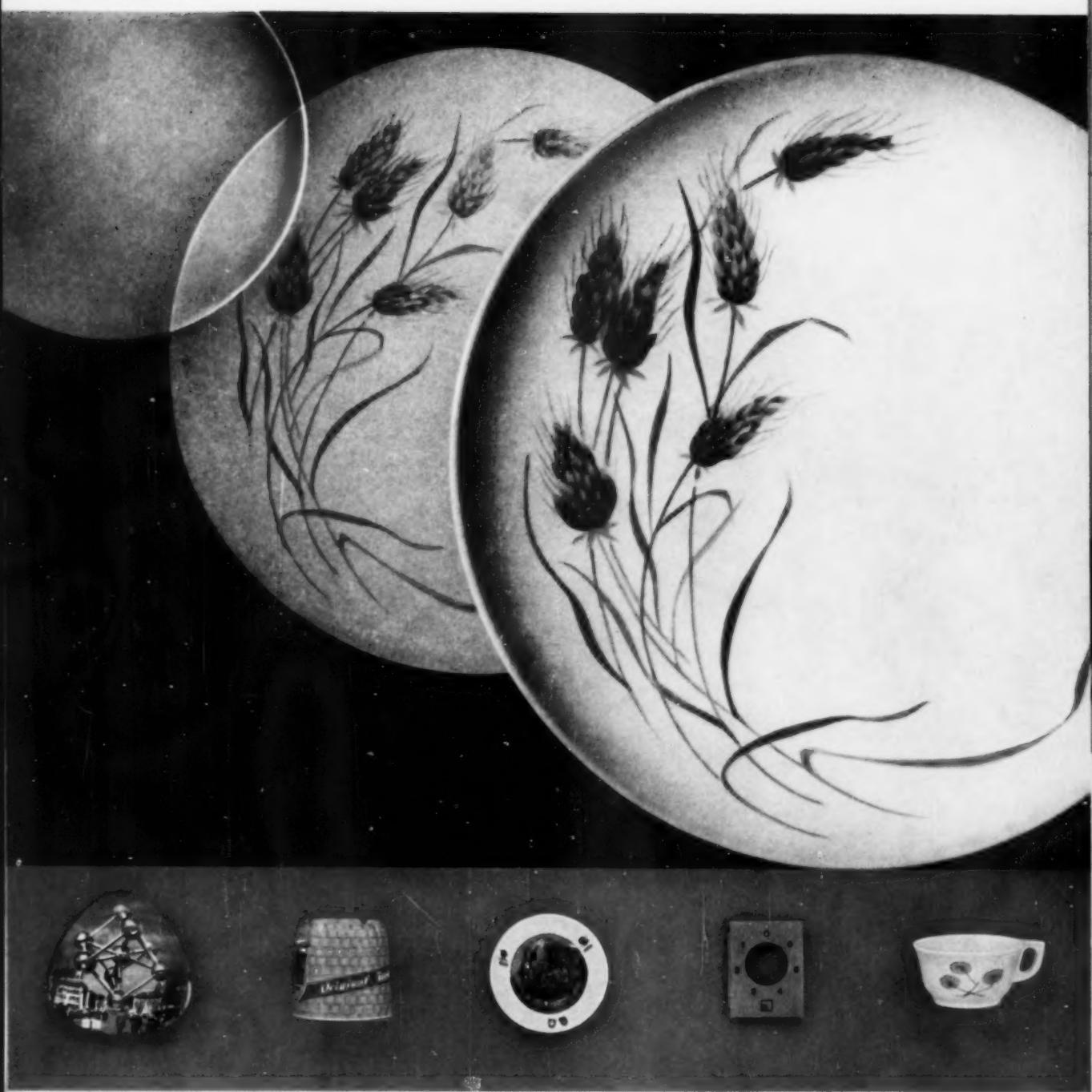




MODERN PLASTICS

JUNE 1960



PHOTOGRAPHED FOR MODERN PLASTICS BY RUDY MULLER

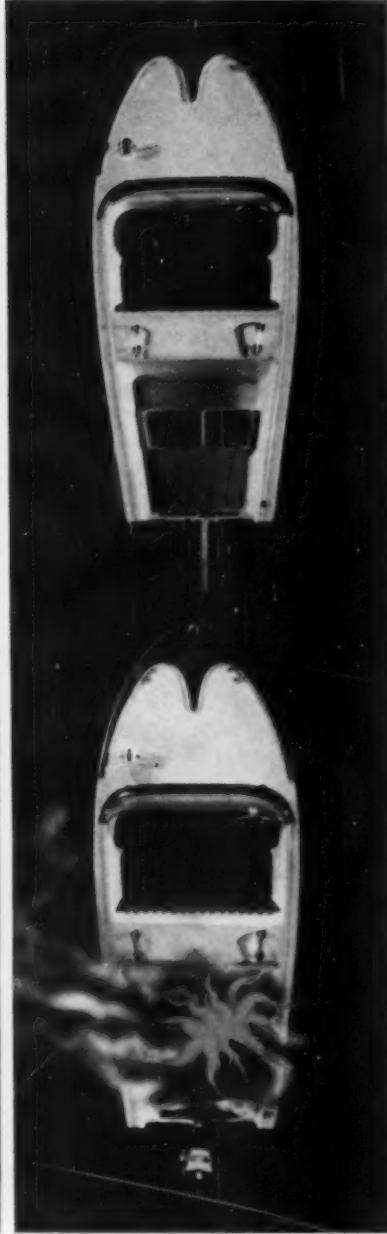
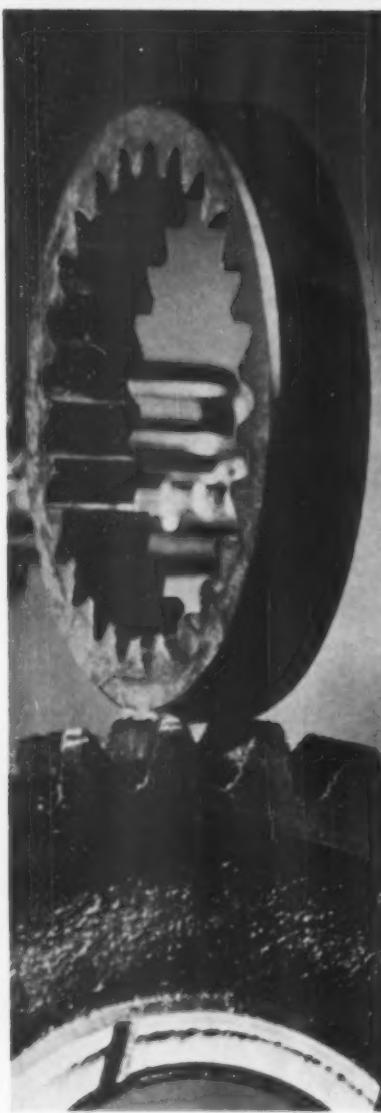
PLASTICS IN THE PRODUCT REVOLUTION:decorated thermosets p. 96

Big business in moldable polystyrene p. 87

Design tips for molded polyethylene parts p. 130

SPECIAL REPORT: the Miami SPI meeting insert facing page 1

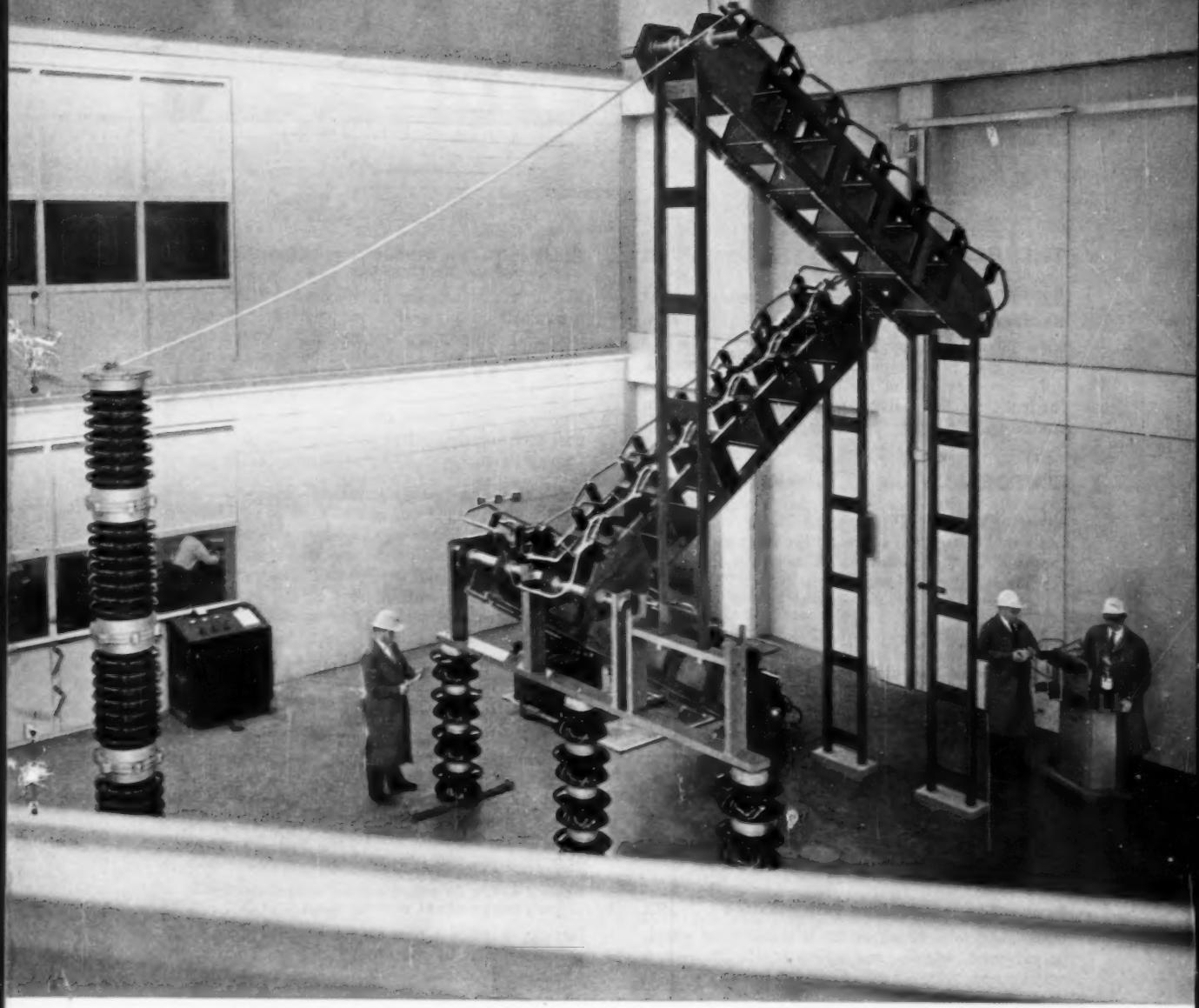
THIS IS
CHEMAGINATION



NEW CONCEPTS in gearing are breaching age-old problems of load and wear, as in this oil-pump gear that lasts three times as long and costs 60% less than gears made of metal. The material: a Durez phenolic reinforced with glass. **FRESH THINKING** on phenolic resins for adhesives is giving the skin of a jet a tighter grip; and resin-modified synthetic rubber has made possible shoe soles that wear as leather never could. All because someone imagined the possibilities of combining the stretch of rubber with the durability and the hardness of Durez phenolics. **BOLD ASSAULTS** on terror are being made with Heton to give us boats that are fire resistant. On other fronts, this stronger fiberglass plastic is confining acids and corrosive vapors. *If you want a fresher, more imaginative outlook* on product design and development, check with the people at Durez. Some of the latest thinking about plastics might be just the ticket. Ask for our Bulletin D400. It's free.

DUREZ PLASTICS DIVISION
HOOKER CHEMICAL CORPORATION, 1206 WALCK RD., NORTH TONAWANDA, N.Y.

HOOKER
CHEMICALS
PLASTICS

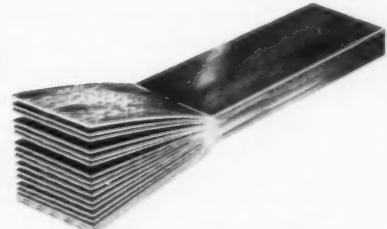


Wood is now made hard, strong, dimensionally stable and impermeable with

Catalin PHENOLIC RESIN

This multi-purpose impulse voltage generator in the new electrical testing laboratory of the Joslyn Mfg. & Supply Co., of Chicago...a major producer of electrical transmission line equipment...is built on an insulating structural framework of **Permalis**^{*}, a unique material with excellent dielectric properties, a tensile strength of 30,000 psi and an amazing ability to withstand severe mechanical stress.

Permalis is produced by impregnating thin wood veneers in vacuum with a special CATALIN PHENOLIC RESIN, filling the cell structure without damage to fibers. Pressure and heat then polymerize the resin and combine it with the wood cells,



physically and chemically. The resultant densified material—marketed in flat or curved sheets, blocks, rods, rings and special fabricated shapes—has been adopted by practically every major heavy electrical equipment manufacturer for a wide range of mechanical and electrical applications.

Catalin produces...at its three strategically located plants in the East, Midwest and South...a complete range of urea, phenolic, cresylic, resorcinol, melamine and acrylic resin formulations for laminating, bonding, impregnating, gluing, finishing, coating and compounding. Literature, samples and technical assistance await your request.

*Product of Permalis, Inc., P. O. Box 718, Mount Pleasant, Pa.

Catalin Corporation of America



One Park Avenue, New York 16, N.Y.



MODERN

• THE PLASTISCOPE

Section 1	41
Section 2	214

New entrant in isocyanate field (p. 41); Dow develops two high-impact polystyrene resins (p. 214); price reduction for nylon (p. 41); Plastics Institute in formative stage (p. 230); Plastic smoke (p. 220).

• EDITORIAL

Chaos in dinnerware	270
---------------------------	-----

Let's make sure the price cutter does not gain a foothold in the melamine dinnerware field and destroy it through lowered quality.

• GENERAL

Boom ahead for styrene foam	87
-----------------------------------	----

Is the molding of expandable polystyrene bead going to be the next major breakthrough in plastics? From a few pioneers in 1955, this segment of the industry has grown to over 100 custom molders today. Double that number, plus uncounted proprietary operations, are expected within the next five years. What are the markets, the materials, and the equipment necessary to get into the business? This first article in a series gives the answers.

Post office modernizes with plastics ..	92
---	----

Semi-automatic letter sorter that relies on vinyl, polystyrene, acrylic, and nylon for function and appearance brings new efficiency to mail operations. Each unit consumes hundreds of pounds of materials. Installed in several key post offices, the unit's success carries important implications for manufacturers of office equipment.

"Custom" drawer mass-produced	95
-------------------------------------	----

A major stumbling block in the sale of plastics drawers has been the fact that, despite offering many advantages, they essentially duplicated the appearance of standard wood construction: a rectangular box open at one end. A new approach, based on specially contoured storage units, thermoformed from polystyrene sheet, may help break this bottleneck.

Plastics in the product revolution: Decorated thermosets	96
--	----

Major breakthroughs in decorative foil extend market from melamine to urea and phenolics, from flat dinnerware to cups, soup bowls, and to deep-drawn and compound-curved industrial parts. Decorated dials, escutcheons, and other scale devices are among latest markets. Molded-in markings and colors eliminate the necessity of post molding decorative operations. The most advanced examples of this technique are illustrated.

For precision spray painting—RP shields	102
---	-----

Two-tone truck bodies are finished with greater efficiency through use of "magnetized" molded reinforced plastics "stencil." One major car maker saved a quarter million feet of 1½-in. masking tape and hundreds of thousands of feet of kraft paper by adopting this system. The technique is directly applicable to mass-production decoration of other compound-curved products.

Vinyl fabrics in a big way	104
----------------------------------	-----

Pioneer of the mass-produced car applies its engineering know-how to establish automated and integrated plant for production of high quality vinyl-coated upholstery fabrics at competitive prices. Here are the full details of the operation. Floor plan, keyed to photographs, shows location of equipment and process flow.

Added entry in plastic-clad metal derby—polyester-steel coil laminate	109
---	-----

Development of a process for bonding decorative polyester film to continuous coils of strip metal promises to widen plastics' penetration into the metal fabricating industries. Price of the new material is between vinyl-metal laminates and plastic-coated metals. TV cabinets and institutional furniture are among first commercial applications.

Polypropylene developments in Italy ..	110
--	-----

Design potential of material is exploited to the fullest in five outstanding European applications that are reported here.

Report from Miami	Facing Page 1
-------------------------	---------------

Special four-page report summarizes the significant developments at the recent Florida meeting of the Society of the Plastics Industry Inc.

Modern Plastics Executive and Editorial Offices: 575 Madison Avenue, New York 22, N.Y. Please mail all correspondence, change of address notices, subscription orders, etc., to above address. Quotations on bulk reprints of articles appearing in this issue are available on request.

Phone: PLaza 9-2710
TWX: NY 1-3063
Cable Address: BRESKINPUB

Printed in U.S.A. by Hildreth Press, Inc., Bristol, Conn. Member, Audit Bureau of Circulations. Member, Associated Business Publications. Modern Plastics is regularly indexed in the Applied Science & Technology Index and Industex.

• ENGINEERING

High-clarity blown PE film 115

A method for improving optical properties of a blown polyethylene film by using a tubular annealing chamber is outlined. Effect of chamber on resin is revealed, and limitations of process are indicated. *By Joseph Pilaro and Richard Kremer.*

How to predict structural behavior of reinforced plastics laminates 120

What happens to fibrous glass laminates subjected to axial and shear loads in the plane of the laminate? Equations are presented with the help of which it is possible to predict failure of each layer in a laminate. *By Lawrence Fischer.*

Design tips for polyolefin parts 130

How to overcome molding defects in polyethylene parts through proper design. *By J. N. Scott, J. V. Smith, and D. L. Alexander.*

• TECHNICAL

Permeability of chlorotrifluoroethylene polymers and copolymers 139

What is the permeability of Kel-F polymers to gases and vapors? What is the effect of crystallinity, plasticization, and copolymerization with vinylidene fluoroide? *By A. W. Myers, V. Tammela, V. Stannett, and M. Szwarc.*

Molybdenum disulfide in nylon for wear resistance 148

Design and molding advantages of MoS₂-filled nylon are spelled out. An explanation of the improved wear characteristic in terms of crystallinity is presented. *By Thomas E. Powers.*

Determination of average cell volume in foamed products 156

The lack of quantitative information concerning the effect of foam structure on cell properties may be due to the absence of a conventional means of describing this property accurately. A method that overcomes this shortcoming has been developed and is here described, with practical applications indicated. *By R. H. Harding.*

• DEPARTMENTS

New Machinery—Equipment 48

What it can do, how much it costs

World-Wide Plastics Digest 56

Condensations of significant articles published in other magazines

U. S. Plastics Patents 60

Issues on new materials, processes

New Developments 164

New ways to use plastics, new design, and new product concepts offer ideas you can use for increased profits

Literature 170

Brochures and books that can help you

Manufacturers' Data 201

Check-off postcard brings booklets gratis

Companies People 252

Promotions, appointments, relocations

Classified Advertisements 260

Index to Advertisers 266

Coming Up . . .

One of the difficulties faced by the prepeg industry has been the lack of uniform standards. Our July lead takes a close look at this problem, shows what's being done to overcome it. . . . Second in our polystyrene foam series reveals the fabulous market of bead board. . . . Ten significant predictions for the 60's. . . . Who's going to be in polycarbonates and what are the markets? . . . Engineering Section will feature article on how to extrude polypropylene film. . . . Technical Section lead will report on the steady-state flow properties of molten polymers and the effect of pressure on these properties. . . . Also in the works: Giant RP structures for industry. . . . The place of dialyl phthalate laminates in the high-pressure laminate field. . . . The Bissell floor appliance revolution. . . . Air conditioning with polyester bags. . . . When and how to use pressure forming. . . . A comprehensive plastics identification chart. . . . Plastics in lighting applications.

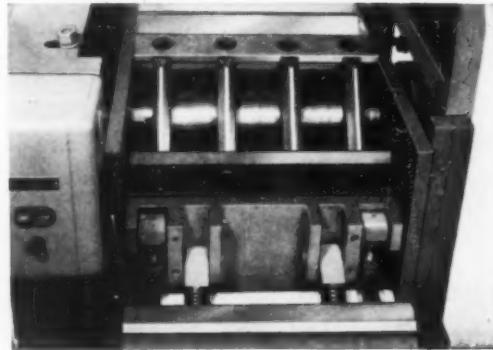
Modern Plastics issued monthly by Breakin Publications Inc. at Emmett St., Bristol, Conn. Modern Plastics Encyclopedia issue published as the second issue in September by Plastics Catalogue Corp. at Emmett St., Bristol, Conn. Second class postage paid at Bristol, Conn. Subscription rates (including Modern Plastics Encyclopedia issue), payable in U. S. currency; in United States, its possessions and Canada, 1 year \$7, 2 years \$12, 3 years \$17; all other countries, 1 year \$25, 2 years \$45, 3 years \$60. Single copies 75¢ each (Show issue, \$1.00; Encyclopedia issue, \$3.00) in the U. S., its possessions and Canada, all other countries \$2.50 (Show issue, \$3.00; Encyclopedia issue, \$6.00). Contents copyrighted 1960 by Breakin Publications Inc. All rights reserved including the right to reproduce this book or portions thereof in any form.

*Reg. U. S. Pat. Off.





FIVE NEW Cumberland *Large Throat* GRANULATING MACHINES



PART OF THE COMPLETE LINE OF CUMBERLAND PELLETIZERS,
BESIDE THE PRESS AND CENTRAL GRANULATING MACHINES,
DICERS, CHOPPERS AND PRE-BREAKERS



CUMBERLAND PELLETIZING MACHINE

New feed roll mechanism provides better control of extruded strands of plastic materials. Cuts cubes or pellets $\frac{1}{8}$ " to $\frac{1}{2}$ ". 14" and 24" openings.



STAIR STEP DICER

Produces perfect cubes or pellets $\frac{1}{8}$ " to 1". Two standard sizes accommodate up to 7" and up to 14" ribbons.

LARGE THROAT OPENINGS — 12" x 16"
(Shown above). Also 7" x 10", 8 $\frac{1}{2}$ " x 12", 8 $\frac{1}{2}$ " x 16", 12" x 20".

QUALITY CONSTRUCTED entirely of steel weldments. Advanced design leaves all working parts readily accessible for cleaning and adjustment of knives.

NEW PERFORMANCE — New knife design and slow rotor rpm provide better granulation and quiet operation. Clean cutting of the complete range of thermoplastic materials from softest polyethylene and vinyls to hard and tough nylon, Cyclocac, and Kralastic.

MINIMUM FLOOR AREA — Desirably compact for central and beside the press applications.

Write now for literature

DEPT. 1 • BOX 216, PROVIDENCE 1, RHODE ISLAND

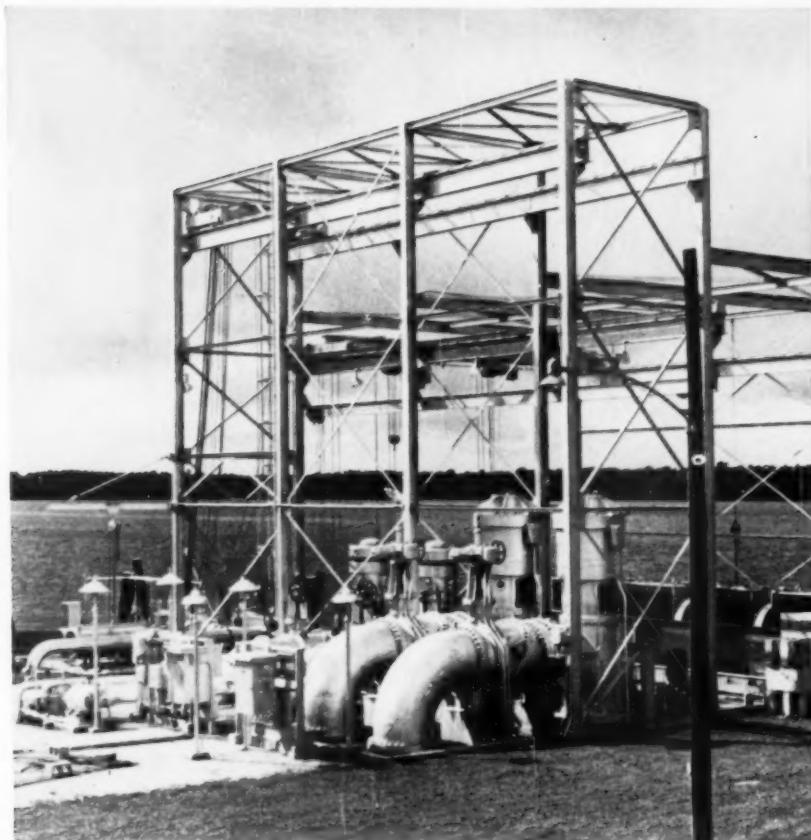
Direct factory engineering assistance available throughout North America from sales offices in Providence, New York, Cleveland, Chicago and Los Angeles
FOREIGN LICENSEE — BURTONWOOD ENGINEERING COMPANY, LTD.
Burtonwood, Warrington, Lancashire, England

Sole Manufacturers and Distributors outside North and South America

Cumberland
ENGINEERING COMPANY, INC.

News about

B.F.Goodrich Chemical *raw materials*



Florida Power & Light Company uses anode racks made of Geon vinyl pipe. Fabricated by F.P. & L. plant personnel at this job. B.F. Goodrich Chemical Company supplies the rigid Geon vinyl. These photos show intake structure at Palatka plant on St. John River, one of many places anode racks of Geon are used.



FP&L fights underwater corrosion with anode racks of rigid GEON

Underwater steel structures corrode when they are attacked by galvanic currents. Florida Power & Light engineers solve the problem two ways. They reduce effect of galvanic currents with an opposing voltage and they suspend anodes of graphite to bear the brunt of any continuing flow. These anodes rest in frames made of rigid Geon pipe.

Vertical side frames are 2" Geon pipe and trays are open sections of 5" pipe. The only effect on the racks

of Geon is the marine growth shown in the photo at upper right. This growth is easily washed off, as photo at lower right shows.

Here's another example of the way Geon vinyl can solve corrosion problems for utilities. As pipe, as conduit, or as coatings, you'll find Geon vinyl is often the answer to your corrosion problems. For more information, write Dept. GJ-6, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable

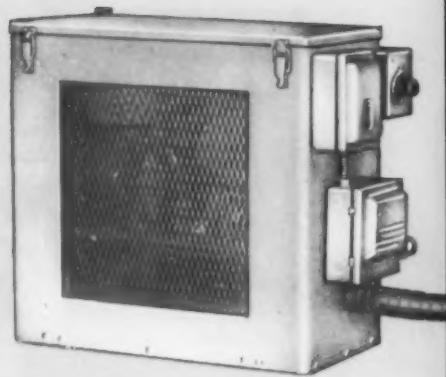
address: Goodchemco. In Canada: Kitchener, Ontario.



B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers



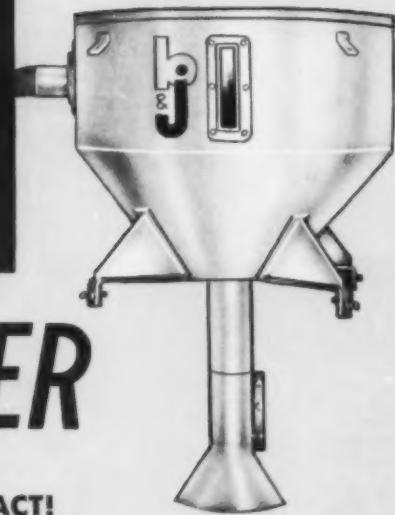
the money
you save by
eliminating
rejects
will pay
for a



HEATER-DRYER

(HOPPER ATTACHMENT)

NEW DESIGN! MORE EFFICIENT! MORE COMPACT!



The newly designed B & J Heater-Dryer will give you more full shots, better surface quality and improved physical properties with a greatly reduced reject rate that will save you money. In fact, the elimination of rejects will save you enough money to pay for a B & J Heater-Dryer that will condition, dry, and pre-heat the material right in the hopper of your injection molding or extruding machine. The Air-Maze filter, with washable filter element, removes dust and dirt from the air. The round B & J Hopper eliminates "dead" spots...heat is spread uniformly...moisture is dispersed faster. You get positive control of temperature from 150° to 235° F...with no chance for heat loss or contamination as can occur in transferring materials from drying ovens.

CONTINUOUS, AUTOMATIC OPERATION

You don't need floor space for a B & J Heater-Dryer. It attaches to the hopper of your injection molding machine or extruder...eliminates double handling of the material...provides continuous, automatic operation. Just load material into the B & J Hopper—that's all! You'll have a better product, fewer rejects, and increased production.

WANT MORE INFORMATION?

Write today for Bulletin D558. It describes the B & J Heater-Dryer in detail. Also ask for our 8-page reprint of the results of a quantitative study of pre-heating polyethylene and impact polystyrene before extrusion.



BALL & JEWELL, INC.

22 Franklin Street, Brooklyn 22, N. Y. • EVergreen 9-6580
Exclusive Export Distributors: Omni Products Corp., New York, N. Y.

B & J HEATER-DRYER ELIMINATES THESE COMMON CAUSES OF DEFECTS

DEFECT	CAUSE
Short shots	Material temperature too low
Bubbles or surface blisters	Material insufficiently dried
Poor welds, flow marks	Material too cold
Brittleness	Improper welding due to cold material
Moist surface or cloudiness	Material too cold, material improperly dried

CADILLAC HAS EVERYTHING IN PLASTIC



RODS SHEETS TUBES

Cadillac mass-produces a wide variety of "Cadco" cast acrylic rods, tubes, block and extruded sheet. Available optically clear, and in a wide variety of colors.

® Registered Trademarks

CADILLAC PLASTIC and CHEMICAL COMPANY

Detroit 3, Michigan, 15111 Second Blvd.

AKRON 8, OHIO, 39 S. Main Street
INDIANAPOLIS, INDIANA, 54 W. 30th
MINNEAPOLIS, MINNESOTA, 210 S. 5th Street
CHICAGO 6, ILLINOIS, 727 W. Lake Street
ST. LOUIS 3, MISSOURI, 2111 Olive Street
CLEVELAND 13, OHIO, 3333 Detroit Avenue
HOUSTON, TEXAS, 6426 Long Drive
OAKLAND 6, CALIF., 949 E. 11th St.

KANSAS CITY, MISSOURI, 1517 Grand Avenue
CINCINNATI 10, OHIO, 1200 Walnut Street
DALLAS 7, Texas, 2546 Irving Blvd.
MILWAUKEE 2, WISCONSIN, 517 N. Broadway St.
SOUTH SAN FRANCISCO, CALIF., 313 Corey Way
LOS ANGELES 57, CALIF., 2305 W. Beverly Blvd
FORT WORTH 1, TEXAS, 1400 Henderson

16 WAREHOUSES TO SERVE YOU
WRITE FOR FREE BOOKLETS

AMERICA'S LARGEST PLASTIC STOCKS

PLEXIGLAS® • VINYLITE® • NYLON • ACETATE • STYRENE • MYLAR®
POLYETHYLENE • PHENOLICS • TEFILON® • KEL-F® • FIBERGLAS • ACRYLIC

We can supply anything in clear and colored plastic material.

Fully stocked warehouses within overnight shipping distance from every major U. S. city.

Cadillac's experienced engineering staff is geared to help you determine the plastic materials you need.

Cadillac now manufactures Nylon and Teflon!

Both "Cadco" brand NYLON and TEFILON are now produced in our modern plant under rigid quality control. Large production capacity assures prompt delivery of NYLON rods, sheet, slab, strip and tubes . . . TEFILON sheet, rods, tubes, tape, bars and cylinders.

PROMPT DELIVERY

Cadillac Plastic and Chemical Company

Gentlemen: Please send me the following booklets

General catalog and prices Fabrication data of "Cadco" Extruded Sheets
 Nylon catalog and prices 157 Ways to use Plastics for maintenance
 Teflon catalog and prices
 Fiberglas catalog and prices

Name _____

Company _____

Address _____ City _____



Commercial Decal can fill your Melamine foil requirements in volume and on time. America's largest, most modern foil production facilities are at your disposal when you order from Commercial Decal, the country's most experienced producer of melamine foils. Design service available. Write for details.

COMMERCIAL DECAL
MOUNT VERNON, NEW YORK

CELANESE MATERIALS REVIEW

- FORTIFLEX linear polyolefins
- FORTICEL cellulose propionate
- ACETATE molding compounds
- ACETATE sheeting
- POLYESTER resins

CELANESE TECHNICAL SERVICE

How to put more experts on your team without extra cost

Celanese has the technical experts who can help you get the most out of plastic materials at any stage from design to final product testing. Here's a rundown on the technical services Celanese can provide with respect to molding.

DESIGN CONSULTATION

In the final stages of a design, you can call on Technical Service to review the design from the standpoint of molding technology. At this point it is possible to forestall problems of moldability and strengthen critical points by simple means such as changing a radius—without affecting basic design.

ASSISTANCE WITH MOLD DESIGN

Celanese Technical Service is prepared to review mold designs and offer recommendations. This includes mold cooling, gate location, sizes of gates and runners, etc. It's surprising how much a slight variation from optimum in mold design can affect the quality of the molded piece. Form retention, surface quality, freedom from warping and sinks, demand a precise knowledge of the geometries involved as well as of the materials.

MATERIAL SELECTION

Literally dozens of basic formulations of the Celanese plastics exist, and new formulations are possible to meet the needs of molders. They vary in melt index, flow temperatures, molding properties, and end-use properties. Often, formulations are

available for special needs, such as flame retardant or light stabilized properties. Here Celanese technical assistance is invaluable in coming up with formulation recommendations that will be most suitable for your product.

EQUIPMENT AND ITS ADAPTATION

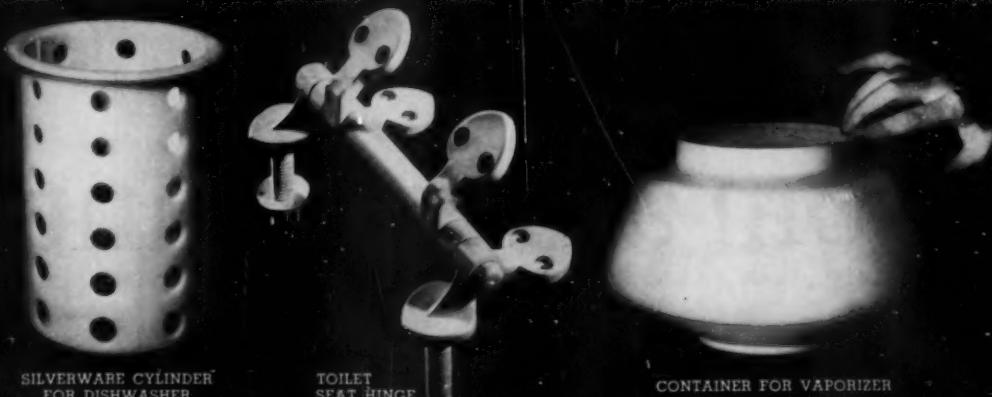
Celanese Technical Service will be glad to discuss your equipment requirements or needed modifications. For example, you may benefit from their knowledge of auxiliary molding equipment, or cooling processes, or the details of molding machinery.

PILOT MOLDING SUPERVISION

Celanese technical experts will help you supervise the first run of material. If material difficulties arise at the molding trials, they will make suggestions for changes and cooperate with you on additional trials. If you desire, they will send samples of the molded parts to Celanese Service Laboratories for evaluation.

This service is available to you now. It can help you avoid pitfalls and save you time and money. For further information, check the coupon.

RUGGED,
ECONOMICAL
MOLDINGS
ARE MADE OF
CELANESE
FORTIFLEX



SILVERWARE CYLINDER
FOR DISHWASHER

TOILET
SEAT HINGE

CONTAINER FOR VAPORIZER



SEND FOR THE NEW FORTIFLEX DESIGN BROCHURE. Gives detailed property and application data on Fortiflex and many suggestions for its use in industrial design. Shows Fortiflex Plastic used to make injection moldings, blow moldings, high-tensile filaments. Write today! Celanese® Fortiflex® Forticel®

Celanese
PLASTICS and RESINS

CELANESE PLASTICS COMPANY, a Division of Celanese Corporation of America, Dept. 101F, 744 Broad St., Newark 2, N. J.
In Canada: Canadian Chemical Company, Limited, Montreal, Toronto, Vancouver
Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Ave., N. Y. 16

Please send me "Designing with Fortiflex"
 Please get in touch with me regarding Technical Service

Name _____

Title _____ Company _____

Address _____

DuPont Announces

PMDA

Pyromellitic
Dianhydride

now available...
from a New Plant in
Commercial Quantities
at a lower price



Price quoted is f.o.b. Gibbstown, New Jersey, for material in standard containers and is subject to change without notice.

This highly versatile dianhydride...

an effective and proven curing agent for epoxy resins—is now available from Du Pont's new multi-million-pound plant, located at Gibbstown, N. J.

Its dianhydride functionality is unique and distinctive, and provides highly reactive and effective cross-linking performance.

Epoxy resins cured with PMDA are characterized by their outstanding thermal stability, electrical properties and chemical resistance.

OPPORTUNITY FOR NEW PRODUCTS

Your research department may already be

familiar with PMDA. Now you can translate their findings into new or improved products, with the new low price and commercial availability of Du Pont PMDA.

If you are not familiar with PMDA, a look into its functions may turn up some exciting new developments for your products.

Considerable technical data about PMDA are available from Du Pont. For copies of these bulletins, simply write to Du Pont, Explosives Department, 6539 Nemours Building, Wilmington 98, Delaware.

Some typical advantages you can get by curing epoxy resins with PMDA

IN CASTINGS. Heat-distortion temperatures above 500°F. can be achieved readily in conventional epoxy resins cured with PMDA. Electrical properties are excellent over a wide range of frequencies and temperatures.

IN LAMINATES. Glass-reinforced resins cured with PMDA retain good flexural and tensile strengths after 1,000 hours at 500°F.

IN COATINGS. Epoxy coatings based on PMDA-glycol adducts have an excellent balance of physical and chemical properties—hard but flexible; excellent adhesion and abrasion resistance; good solvent and chemical resistance. PMDA-glycol adducts can be used for baked epoxy coatings or coatings which cure at room temperature.

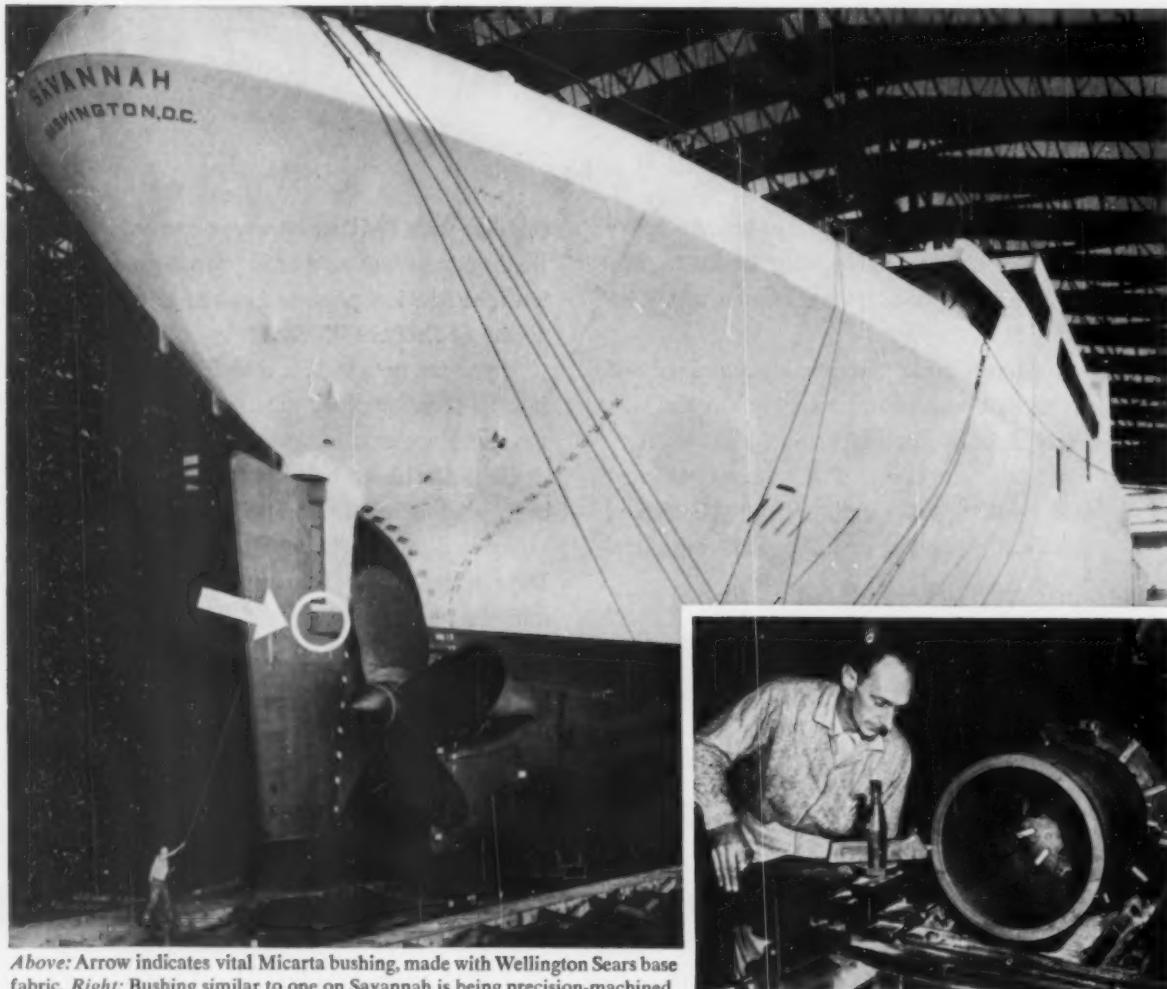
IN ADHESIVES. Epoxy adhesives cured with PMDA have good tensile-shear strengths even after 200 hours at 500°F.



PMDA (PYROMELLITIC DIANHYDRIDE)

BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

Fabric helps world's first nuclear merchant ship steer true course



Above: Arrow indicates vital Micarta bushing, made with Wellington Sears base fabric. Right: Bushing similar to one on Savannah is being precision-machined.

With the N. S. Savannah ready to start setting new trans-oceanic speed records for merchant ships, a 60-lb. bushing enclosing its rudder pintle assumes great responsibility for keeping the nuclear-powered ship on course.

This type of bushing, while relatively insignificant on ordinary vessels, is of great importance on the Savannah because of the unusual stresses placed on the rudder by the ship's added speed.

The material selected for this vital job is Westinghouse Micarta, using Wellington Sears base fabric. This phenolic laminate was chosen, according to architect George G. Sharp,

"for economy, utility, efficiency, and safety of the ship." The bushing was fabricated by Hershell Engineering & Supply Company of Philadelphia, a member of the Micarta Fabricators Association.

Providing base fabrics that solve such complex problems as this is only one of the many ways Wellington Sears meets the changing fabric needs of industry. Why not find out how our 114 years of experience can help solve your problems with fabrics for laminating, coating, rubberizing and other industrial applications. Write today for free illustrated booklet, "Fabrics Plus," Dept. K-6.

WELLINGTON SEARS

FIRST In Fabrics For Industry

For Coated Materials, High and Low Pressure Laminates, and other Reinforced Plastics Products

Wellington Sears Company, 111 West 48th Street, New York 18, N.Y. • Akron • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco





Inlaid Wataseal as used in dinette sets by the Howell Company, St. Charles, Ill.

4 beautiful examples of mind over matter, using PLIOVIC

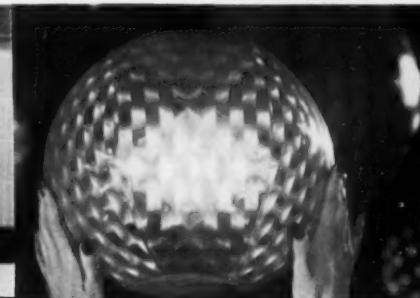
Pearlescent Watahyde



Three-dimensional Wataseal as used in bathroom sets by Pearl-Wick Corp., New York, N.Y.



Iridescent Wataseal



Photographs taken with the cooperation of Harte & Co., Inc., New York, N.Y.—manufacturers of famous Wataseal and Watahyde vinyl fabrics.

Virtually anything that comes to a designer's mind can be achieved when high-quality vinyl resin is placed in the hands of expert processors.

The case in point: the strikingly beautiful, pearlescent, iridescent, three-dimensional and inlaid vinyl films shown above—all made with PLIOVIC.

PLIOVIC is used because, in the various grades available, it offers the physical properties and processing characteristics needed to make each film practical. Some examples: Good blending and dispersion qualities. Low fluxing and fusion temperatures. Excellent embossing and heat sealing. Good ink acceptance. Exceptional heat and light stability.

Whatever comes to your mind could well be put into practice through PLIOVIC—in films or a host of other products. For full details write: Goodyear, Chemical Division, Dept. R-9422, Akron 16, Ohio.



lots of good things come from

GOOD **YEAR**
CHEMICAL DIVISION

PLIOVIC—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Watahyde, Wataseal—T. M.'s Harte & Co., Inc., New York, N.Y.



Acetate Sheeting ...

by **JOSEPH DAVIS PLASTICS COMPANY** is the perfect material to make this formula work, and the blister pack shown above is an excellent example. Designed by the Northam Warren Corporation for its Cutex Emery Boards, it is fabricated and printed by **Western Printing Company**, Teaneck, N. J., using JODA crystal clear acetate. This type package not only protects the product from shipping, handling and shelf wear, but allows it to be seen **instantly** as well—the ideal combination for successful selling.

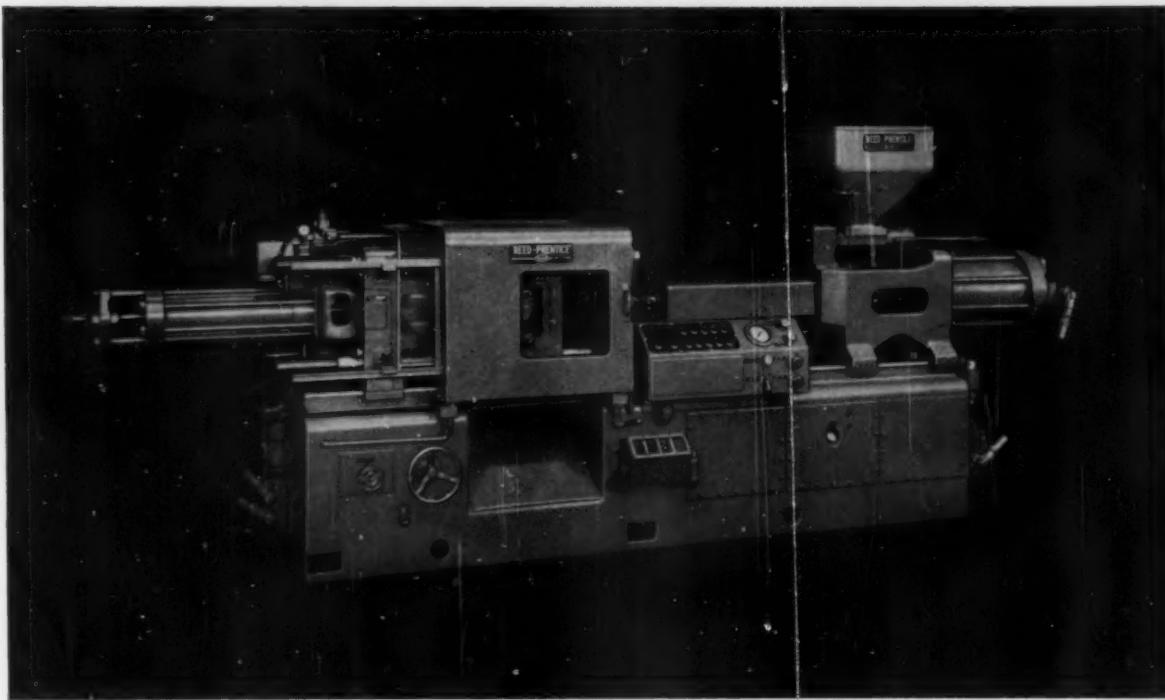
JODA extruded acetate sheets, rolls and film in all gauges — transparent, translucent or opaque — are excellent for vacuum forming. Why not investigate the advantages of JODA acetate and see for yourself how it can help solve your packaging problems? Send for Brochure MP.



JOSEPH DAVIS PLASTICS CO.

434 Schuyler Ave.
Kearny, N. J.

Phone
WYman 1-0980
N.Y. BArclay 7-6421



NEW REED 275TA-8/10 oz. gives you longer stroke ... larger platens

Here's another new Reed-Prentice injection molding machine designed to keep molders ahead of fast-rising production costs. The 275TA has been developed to handle larger molds at high speeds, provide a longer stroke. It is equipped with a completely redesigned safety circuit. These extra features add up to lower unit costs and greater profits to the molder. Look at these big features on the new REED 275TA.

- **LARGER PLATENS.** Die plate measures 27 x 27½, provides a 15½ x 15½ inch space between tie bars.
- **NEW, ADJUSTABLE LONG-STROKE.** Redesigned link end gives a longer, more flexible adjustable mold clamping stroke. You get more than a 50% increase in mold depth.
- **NEW SAFETY CIRCUIT.** Front safety door is equipped with double limit switches and a hydraulic lock. The limit switches are interlocked with a hydraulic arrangement that is self-monitoring. If any part of the safety circuit fails, the machine will open and stop, providing the ultimate in personal safety.
- **FASTER, EASIER SETUP.** Hydraulically-operated die space adjustment and plunger housing speed setups, eliminate nozzle breakage.

All REED injection molding machines are designed to boost output and cut production costs ... to keep profits at a high level. For complete information on the new 275TA and the full line of REED injection molding machines, call your nearest REED Sales Engineer.

NEW 275TA SPECIFICATIONS

Mold Clamping pressure, tons	275
Mold clamping stroke (adjustable)	6½ to 11½"
Platen Size (Horizontal & Vertical)	27 x 27½"
Diameter of Tie Bars	3½"
Space between tie bars	15½ x 15½"
Plasticizing Capacity (lbs. per hour)	120
Cycles per hour (maximum)	470

REED-PRENTICE

.....division of

EAST LONGMEADOW, MASSACHUSETTS

PACKAGE
MACHINERY COMPANY

BRANCH OFFICES: BUFFALO • CHICAGO • CLEVELAND • DEARBORN • KANSAS CITY • LOS ANGELES • NEW YORK

Kodak

CAVALCADE PROJECTOR

FINEST OF THE AUTOMATICS!



SLIDE TRAYS IN MOLDED THERMOPLASTIC

by- *Quinn Berry*

CHELSEA 50, Mass.
Joseph Leader
68 Marlborough Street
Turner 4-3484

CHICAGO 45, Illinois
R. H. Frish
Room 211
6349 N. Western Ave.
Ambassador 2-6005

DETROIT 35, MICH.
Harry R. Brothen Co.
16577 Meyers Road
Diamond 1-3454

EAST ROCHESTER, N. Y.
Dynotherm Inc.
607 West Commercial Street
Phone: Ludlow 6-0082

KNOXVILLE, Tennessee
Harold J. Molley
2100 Ailer Ave.
P. O. Box 3207
Phone: 2-5911

MILWAUKEE 13, Wis.
John Wolland, Jr.
7105 Grand Parkway
Greenfield 6-7161

ARDMORE, Pa.
Austin L. Wright Co.
P. O. Box 561
1 W. Lancaster Ave.
Midway 2-5113

The versatility of Quinn-Berry engineering and craftsmanship demonstrates itself again in this Kodak Slide Tray of molded thermoplastics.

Dimensional stability plus the meeting of exacting tolerances for the slide guides characterize the requirements of these Kodak Cavalcade Projector Components. Slides must move through the projector smoothly and noiselessly—any possibility of chatter or jumpiness must be avoided.

Careful choice of thermoplastics, skilled precision mold design and dependable, experienced press room operation . . . these are the "ingredients of success" in producing parts to meet the demands of the popular Kodak Cavalcade Projector, "Finest of The Automatics".

You can depend upon Quinn-Berry capabilities to meet your requirements for precision molded thermoplastic parts. Place your parts requirements with Quinn-Berry where the Unusual is Routine.

WE FLY TO SERVE YOU FASTER!



FROM MISSILES TO MISSILES...



GERING Thermoplastic MOLDING COMPOUNDS

quality formulated to perform as required!

Roaring down the Atlantic test range or blasting off from the living room floor, true missile performance depends on the accurate behavior of individual components. That's where Gering's expert ability to formulate superior thermoplastic Molding Compounds comes in. Whether the end use

is a vinyl jacketing compound that helps trigger a giant ICBM into space or an impact styrene toy replica, quality Gering Molding Compounds perform to perfection. Extensive laboratory and production facilities enable Gering to produce to your most exacting specifications — including flame-retardant,

non-toxic, semi-conductive and other special formulations. And with these complete facilities at your service, your most demanding custom compounding requirements can always be met. Tell us your specific needs. We'll be happy to submit a recommendation at no obligation. Write today for information.

• Polyethylene • Vinyl • Styrene • Impact Styrene
• Acetate • Nylon • Acrylic • Styrene Copolymer • Butyrate

Cable Address: GERING • TWX Cranford, N.J. 137 • Sales Offices: 5143 Diversey Ave., Chicago 39, Ill.
1115 Larchwood Rd., Mansfield, Ohio • 103 Holden St., Holden, Mass.

GERING
PLASTICS

division of STUDEBAKER-PACKARD CORP.
Kenilworth, N.J.



NEW PRODUCTS...

NEW MARKETS...

NEW PROFITS...with

**MPM DIVERSAMATIC
TWIN-STATION**

BLOW MOLDING

MACHINE

**Boost profits... blow mold high quality hollow
products the low-cost DIVERSAMATIC way:**

VERSATILE — Molds items 1" to 34" long of almost any shape from polyethylene... polypropylene... high impact styrene... acetate... nylon and other materials. Independent controls permit use of 2 identical or 2 different molds at the same time.

FAST — Two-station "Y" design manifold, both stations handy to operator. "Y" design means maximum pressure from extruder.

SAFE — Automatic electric-eye safety provides complete protection, speeds production.

COMPLETE PACKAGE — DIVERSAMATIC blow molding machines and matching electrically heated extruders... all manufactured by one reliable source: MPM.

Get into this high profit, fast growing plastic process... get engineering data and other detailed information on blow molding machines and extruders... get this new technical bulletin on BLOW MOLDING EQUIPMENT from MODERN PLASTIC MACHINERY CORP. or your MPM representative.

MODEL V-21*

For maximum mold dimensions

36" long, 21" wide with 28" daylight, 14" stroke.

*Other models available with single, 4, 6 or 8 stations.



**MODERN PLASTIC
MACHINERY CORP.**

64 LAKEVIEW AVE., CLIFTON, N. J.

REGISTRY 3-6218 • CABLE ADDRESS: MODPLASEX

CALIFORNIA SALES REPRESENTATIVES: West Coast Plastics Distributors, Inc., 9014 Lindblade St., Culver City, Cal. • GENERAL FOREIGN AGENTS (Except Canada and countries listed): Ballithall Engineering Co., 1010 Schaff Bldg., 1505 Race St., Phila. 2, Pa. • BRAZIL: Binoco Agencias E Comissões, Ltda., Av. Ipiranga, 679-9-4, São Paulo; Rua do Ouvidor, 50, Rio de Janeiro • ARGENTINA: Ghacrom S. r. Ltda., Zamudio 1540, Buenos Aires • MEXICO: Importación Y Técnica Ing. Radolfo Furtado C., Av. Mexico Num. 117 Loc. B, Mexico 11, D.F. • JAPAN: Monofilament and Sheet Film only. Rabco Technical Equipment Corp. (Chugai Boyaki Co., Ltd.), 25 East 25th St., N. Y. 10, N. Y. • NORTHWEST U. S.: Frank Mure, Mure Plastics Co., 801 Spring St., Seattle 4, Wash.

©1960 Modern Plastic Machinery Corp. 60-4

26 FOREIGN COUNTRIES ARE
SERVED BY **MUEHLSTEIN** AGENTS.

THROUGHOUT
THE WORLD

MUEHLSTEIN

FOR

**RUBBER
and PLASTIC**

RAW MATERIALS

Service
Quality
Integrity

H. MUEHLSTEIN INC.

521 FIFTH AVENUE

NEW YORK 17, NEW YORK

REGIONAL OFFICES: Akron • Boston • Chicago • Los Angeles • Toronto • London

PLANTS AND WAREHOUSES: Akron • Boston • Chicago • Detroit • Indianapolis
Jersey City • Los Angeles • Louisville

11 OTHER DISTRIBUTION CENTERS THROUGHOUT THE COUNTRY



Reifenhäuser opens New Fields in Extruder Design

This is the result of applying a system of pre-assembled and interchangeable units in the construction of our extruders, available with screw diameters of $1\frac{1}{4}$ ", $1\frac{3}{4}$ ", $2\frac{1}{2}$ ", $3\frac{1}{2}$ ", $4\frac{1}{4}$ ", and 6".

Our complete extrusion plants display also constructional components of the most advanced kind. They are noted all over the world for their high outputs, long and trouble-free working life, and economy in use. As complete productive units they serve for the processing of thermoplastic materials into:-

Sheets, pipes, profiles, mono-filaments, synthetic bristles, lay-flat film, cast film, embossed plastic sheets, and formed articles direct from the extruded sheet. We also supply equipment for the covering of cable, wire, and all other profiles.

Please contact our representative and discuss your extrusion problems with him.

We have agencies in:-

Australia
Austria
Argentina
Belgium
Brazil
Burma
Chile
China
Columbia
Cuba
Denmark
Ecuador
Finland
France
Germany
Great Britain
Greece
Holland
India
Iran
Italy
Japan
Mexico
New Zealand
Norway
Pakistan
Poland
Portugal
Sweden
Switzerland
Spain
South Africa
Venezuela

Representative for sales and service
in USA and Canada:

HEINRICH EQUIPMENT CORP.
111, Eighth Avenue, NEW YORK 11, N.Y.



Production of blown film;
11'6" wide lay-flat tubing



General view
of a Sheet Manufacturing Plant



Extruder 5120
($4\frac{1}{4}$ " screw diameter)

Reifenhäuser KG
MASCHINENFABRIK

TROISDORF
West Germany



Vernon L. Waldon
President, Plastene Corporation
A Subsidiary of American Thermos Products Co.

"With our coast-to-coast and Canadian operations, we look for molding equipment that is 'backed' to the limit. We bought H-P-Ms for all four of the plants because they are high producers and dependable. Then, too, H-P-M has superior engineering and service organizations to give us the kind of service backing we need."

V.L. Waldon



Display boxes for Timex Watches are produced in a 12 Cavity mold on this H-P-M 450-HV-20/28 (20/28 oz. capacity) machine. Weight of shot — 22½ oz. Projected area — 265 sq. in. Molded at Plastene Corp., Crawfordsville, Indiana.

10 New H-P-Ms in 2 Year Expansion Program

Mr. Waldon, managing the plastic production for Plastene Corporation plants in Indiana, California and Connecticut, has chosen H-P-M plastic injection machines for the most logical of all reasons: The need for high production and the service and engineering back-up to keep his machines at top efficiency. H-P-M machines are also used by Canadian Thermos Products Co., Limited, another operation in Canada.

To be "on the move" in the fast growing

plastic industry, you'll appreciate the backing of a sales engineering and service force strategically located to keep your equipment operating at top production capacity. You get this with H-P-M for preventative maintenance, parts replacement or machine modification. For complete information on injection molding machines — 6 to 300 oz. — call your H-P-M sales engineer today. Buy the line that's "backed" the best to keep you "moving" at top production.

THE HYDRAULIC PRESS MANUFACTURING COMPANY
A Division of Koehring Company • Mount Gilead, Ohio, U.S.A.



H9

CHROMALOX
THE NAME IN ELECTRIC HEAT

Precisely controlled Radiant Heaters pre-heat plastic-coated paper for foreembossing without burning or scorching.

Radiant heaters in hood cure centrifugally molded glass fiber reinforced torpedo tubes.

Ten radiant heaters automatically controlled for flexible, uniform vacuum forming.

EDWIN L. WIEGAND COMPANY
7500 Thomas Boulevard • Pittsburgh 8, Pa.
Churchill 2-6400

At the turn of a dial...

CHROMALOX

ELECTRIC RADIANT HEATERS

fast, uniform, economical, safe

Here's high-intensity heat . . . adjustable from 0 to 100% of heating capacity by fingertip control. Different zones of heat intensity can also be set up . . . by arranging heaters in different "banks" with individual controls for each.

Chromalox Far-Infrared (long wavelength) is absorbed almost equally fast by all colors, textures and surfaces . . . including clear glass, plastics, cellophane.

For heating, baking, drying, curing, pre-heating, dehydrating, pre-expanding.

Space-saving, non-breakable, all-metal units withstand knocks, bumps, vibration. Moisture-resistant terminals available. No fumes, flames, glare or leaky pipes. Standard heating lengths to 150 inches. Immediate delivery from stock. Low-cost installation and operation. You can build production line heating tunnels, ovens, banks right on the job.

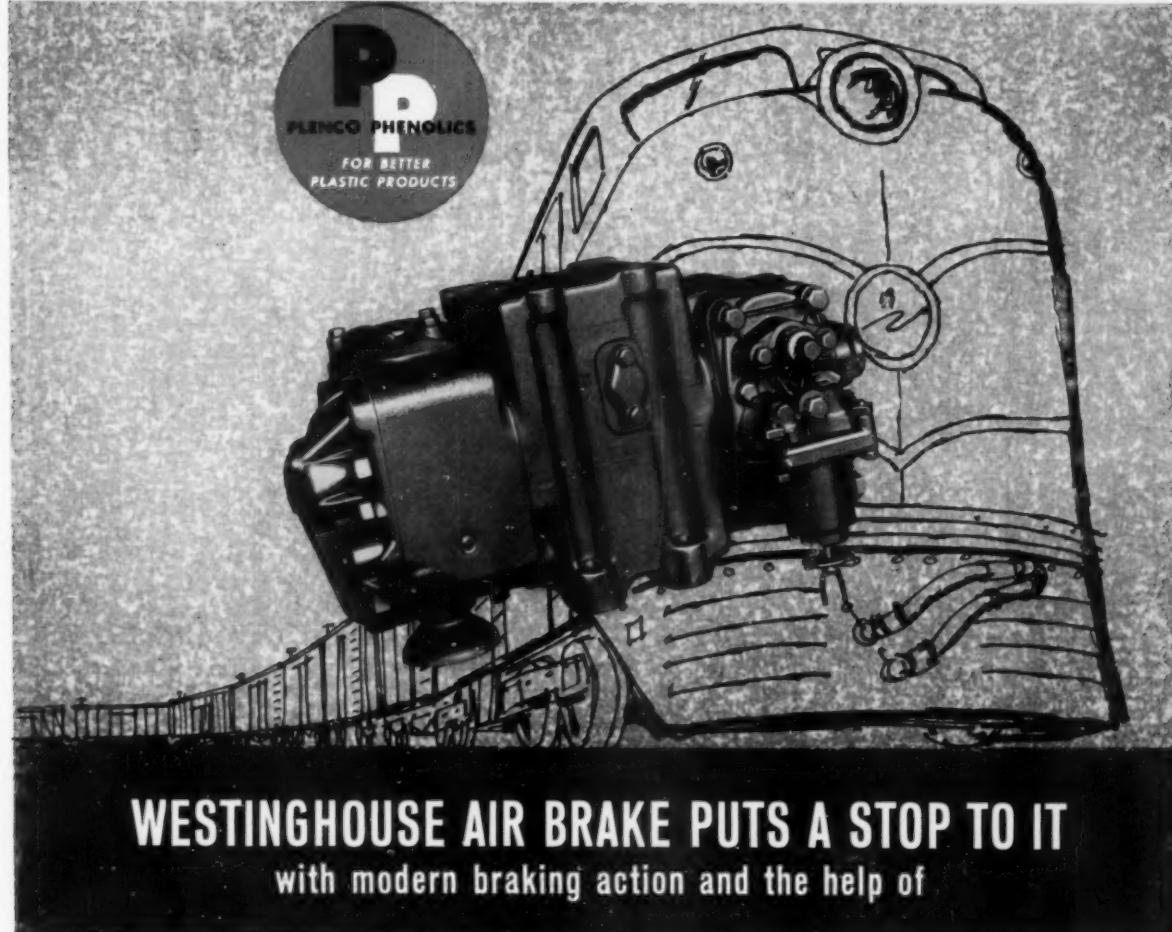
Write for Bulletin G62. Or, for fast action and on-the-job assistance with your heating problem, call your Chromalox Man listed below.

81874

Call Your Chromalox Man for Heating Answers

ALBANY, N.Y.	INDIANAPOLIS, IND.
Hobart 3-0626	Merrose 5-5313
ATLANTA, GA.	KANSAS CITY, MO.
Trinity 5-7244	Victor 2-3306
BALA-CYNWYD, PA.	LOS ANGELES, CAL.
Mohawk 4-6113	Richmond 7-5191
Greenwood 3-4477	MIDDLETOWN, CONN.
BALTIMORE, MD.	Diamond 6-9606
Hopkins 7-3280	MILWAUKEE, WIS.
BLOOMFIELD, N.J.	Broadway 1-3021
Edison 8-6900	MINNEAPOLIS, MINN.
New York: Worth 4-2990	Federal 6-6631
BOSTON, MASS.	NASHVILLE, TENN.
Liberty 2-1941	Cypress 2-7016
BUFFALO, N.Y.	NEW YORK CITY, N.Y.
Summer 4000	(See Bloomfield, N.J.)
CHARLOTTE, N.C.	OMAHA, NEB.
Edison 4-4244	Atlantic 7600
Franklin 5-1044	PHILADELPHIA, PA.
CHATTANOOGA, TENN.	(See Bala-Cynwyd, Pa.)
Amherst 5-3862	PITTSBURGH, PA.
CHICAGO, ILL.	Emerson 1-2900
Harrison 7-5464	PORTLAND, ORE.
CINCINNATI, OHIO	Capitol 3-4197
Trinity 1-0600	RICHMOND, VA.
CLEARWATER, FLA.	Atlantic 8-8758
Phone 3-7705	ROCHESTER, N.Y.
CLEVELAND, OHIO	Hamilton 6-2070
Prospect 1-7112	ST. LOUIS, MO.
COLUMBUS, OHIO	Chestnut 1-2433
Amherst 7-8260	SAN FRANCISCO, CALIF.
DALLAS, TEX.	Underhill 1-3527
Riverside 8-9004	SEATTLE, WASH.
DAVENPORT, IOWA	Main 4-7297
Phone 6-5233	SOUTHFIELD, MICH.
DENVER, COLO.	Kenwood 8-2100
Glendale 5-3651	Elgin 7-0677
Genesee 3-0821	SYRACUSE, N.Y.
DES MOINES, IOWA	Granite 4-3933
Cherry 3-1203	WICHITA, KAN.
DETROIT, MICH.	Amherst 2-5647
(See Southfield, Mich.)	
HOUSTON, TEX.	
Capitol 5-0356	

IF PHENOLICS CAN DO IT **PLENCO** CAN PROVIDE IT—AND DOES—FOR WESTINGHOUSE AIR BRAKE



WESTINGHOUSE AIR BRAKE PUTS A STOP TO IT

with modern braking action and the help of

PLENCO

PHENOLIC MOLDING COMPOUNDS

When a freight car stops, many cargo-tons must be stopped with it . . . more today than ever before. Modern freight trains are longer, the engines more powerful; speeds are higher . . . *All this calls for more effective methods of retardation control—a better brake.*

"AB" freight car brake equipment developed by Air Brake Division, Westinghouse Air Brake Co., Wilmerding, Pa., has kept pace with such railroading progress through the years. Today's "AB" equipment provides for smoother train slack control. Damaging shocks are prevented with emergency transmission approximately 40% faster than with former standard equipment.

At the heart of this modern brake-power is the "AB" Valve. And within the valve—the pistons.

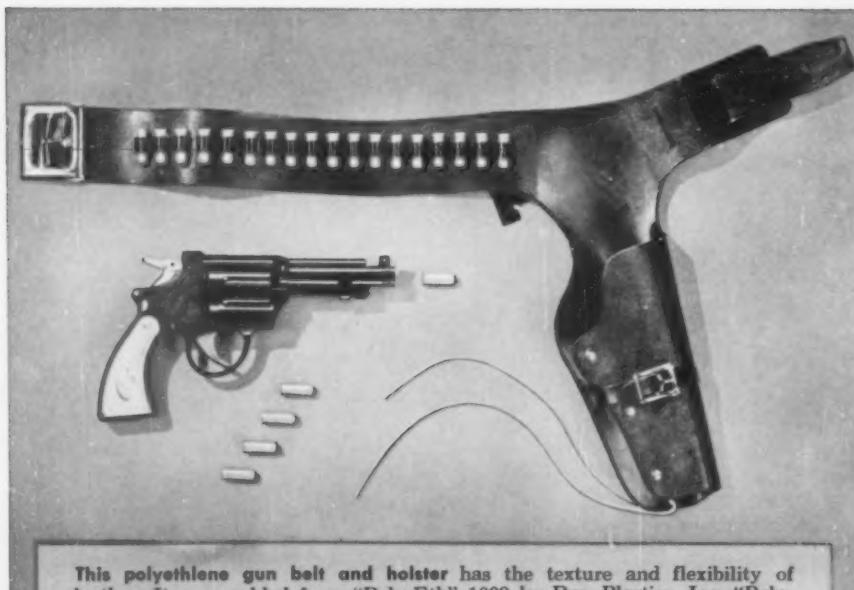
Because these pistons must work smoothly at all times, Air Brake Division engineers use piston bushings molded of Plenco phenolics. The Plenco phenolic molding compound specified by Air Brake Division possesses low and uniform anti-friction characteristics together with dimensional stability. It insures resistance to impact from piston "joggling" that would tend to cause bush grooving.

Piston bushings are, of course, a special kind of problem. Your problem or product surely has its own requirements. Special or not, if they call for understanding attention, broad experience with many industries, and ready availability of an extensive selection of general and special-purpose phenolic molding compounds—call on Plenco.

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins



This polyethylene gun belt and holster has the texture and flexibility of leather. It was molded from "Poly-Eth" 1009 by Ray Plastics, Inc. "Poly-Eth" 1009 is one of Spencer's complete family of specialized molding resins.



Rubbermaid selected "Poly-Eth" 1408.5 from Spencer's complete family of molding resins to mold this 45-quart wastebasket. Rubbermaid also uses "Poly-Eth" 1408.5 in molding many other household items.

How Spencer's Complete Family Of "Poly-Eth" Resins Meet Any Molding Need

A toy gun belt and holster that's as thin, textured and flexible as real leather. A heavy-duty, 45-quart wastebasket that's stiff and strong. Each of these different molded products requires a different polyethylene resin. Yet, each was molded from one of Spencer Chemical Company's complete family of unique new "Poly-Eth"® molding resins.

Of all the resins tried by Ray Plastic, Leominster, Mass., for their new "Lightning Draw" holster and gun belt, only Spencer "Poly-Eth" 1009 flowed well enough to fill the mold and produce a firm, thin wall over a large area. These excellent flow properties also permit good dispersion of black masterbatch for coloring.

The gun belt molded from "Poly-Eth" 1009 has the flexibility needed for folding and riveting to form the holster. "Poly-Eth" 1009 has a melt index of 50 and a density of .915.

For many different household items, ranging in size up to 45-quart wastebaskets, Rubbermaid uses Spencer's new universal resin, "Poly-Eth" 1408.5.

In different machines of various sizes, "Poly-Eth" 1408.5 always has excellent moldability. It allows the molding of large items in faster cycles. It flows easily, sets up fast and reduces rejects.

Less lot to lot variation is another benefit of "Poly-Eth" 1408.5. It has a melt index of 22 and a density of .925.

These different products with different requirements are just two examples of how Spencer's complete family of "Poly-Eth" molding resins can be used in the toughest molding jobs. Whatever your molding needs, you can easily satisfy them with "Poly-Eth" resins. And, you're sure of getting prompt, on-time deliveries.

Your Spencer representative will be happy to discuss the application of inexpensive, versatile "Poly-Eth" resins to your requirements. For information, contact Spencer Chemical Company at address below.

*Spencer Chemical Company markets Spencer "Poly-Eth" Polyethylene. Spencer "Poly-Pro" Polypropylene and Spencer Nylon. "Poly-Eth" and "Poly-Pro" are registered trademarks of Spencer Chemical Company.



Poly-Eth® Polyethylene



SPENCER CHEMICAL COMPANY, DWIGHT BLDG., KANSAS CITY, MISSOURI

If you want to make
MELAMINE DINNERWARE
or other
DECORATED UREA PRODUCTS
(including knobs, dials, instrumentations, other industrial products)
you need

FAIREY FOILS*

for the decorative range and beauty of fine porcelain finishes

"FAIREY FOILS" is the trade mark of Fairhaven Properties Corporation, whose resources are presently devoted to this three-point development program in the art of decorated melamine and urea molding:

1. A sharp reduction in the length of the molding cycle.
2. A foil which permits deep-draw decoration.
3. Rigid quality-control in foil manufacture to prevent costly hit-or-miss results.

Fairey Aviation Company Ltd. of Hayes, Middlesex, England, holds U.S. Patent No. 2,646,380 for the manufacture and use of foils (overlays) for the decoration of melamine and urea products. Under this patent, Fairhaven Properties Corporation, Starr and Borden Aves., Long Island City, New York, is the exclusive licensee for the United States and Canada.

Important to Molders: Ornapress A.G. of Switzerland—pioneer in the development of melamine and urea decorative "foils" for dinnerware, souvenirs, dials, knobs, industrial items, etc.—is presently engaged in collaborating with Fairhaven Properties. Sub-licensing agreements for the manufacture of FAIREY FOILS have been made between Fairhaven Properties Cor-

poration and the following select quality-controlled color printers:

American Decalcomania Co., Chicago, Ill.; Commercial Decal, Inc., Mount Vernon, N.Y.; Kaumagraph Corp., Wilmington, Del.; Superior Decals, Inc., Dallas, Texas; Ranko Products, L.I. City, N.Y.; Mulder & Zoon, Amsterdam, Holland; & Ornapress A.G., Zurich, Switzerland.

Inquiries from other quality color printers concerning additional sub-licensing agreements will be given careful consideration by Fairhaven Properties Corporation.

Important: Any infringement or contributory infringement of Patent No. 2,646,380 will be prosecuted to the full extent of the law.

*TRADE MARK

**FAIRHAVEN
PROPERTIES
CORPORATION** Starr & Borden Aves., Long Island City 1, N. Y. RAvenswood 9-8900

"FAIREY FOILS" are applicable for decorative range and beauty to a great variety of articles molded either of melamine or urea.



521 North La Brea Ave. • Los Angeles 36, California

NAME _____

COMPANY _____

ADDRESS _____ CITY _____

I'm attaching a sketch of a label or printed tape we need (with quantities). Also, some of our literature. Send us design, quotes and samples. (no obligation of course)

I would like a redesign and quote on our present label. I am attaching a sample. The quantity to figure is _____

Please send your suggestions as to dispensing and applying pressure sensitive labels printed tapes.

Please send samples and more information on tapes and labels applicable to our business. Our products are _____

B-2



some birds sing of the economy
of many types of labels other than pressure sensitive (the kind you wet, glue or heat seal) and many of them are less expensive...

but . . . the man hours
that PeeCee pressure sensitive labels and printed tapes save you, because of the ease and speed of their application (no moisture, or heat, just press on), their small amount of spoilage, and their longer life...make your *total applied cost* much less!

Manual or completely automatic dispensers can be installed on your production line...ready to identify , decorate , instruct and promote with pressure sensitives.

PeeCee offers the largest selection of printed pressure sensitive tapes and labels available...completely tamper-proof or really removable...for any surface.

Send in the coupon above or call one of our plants* or sales offices near you for immediate attention and *fastest* delivery.

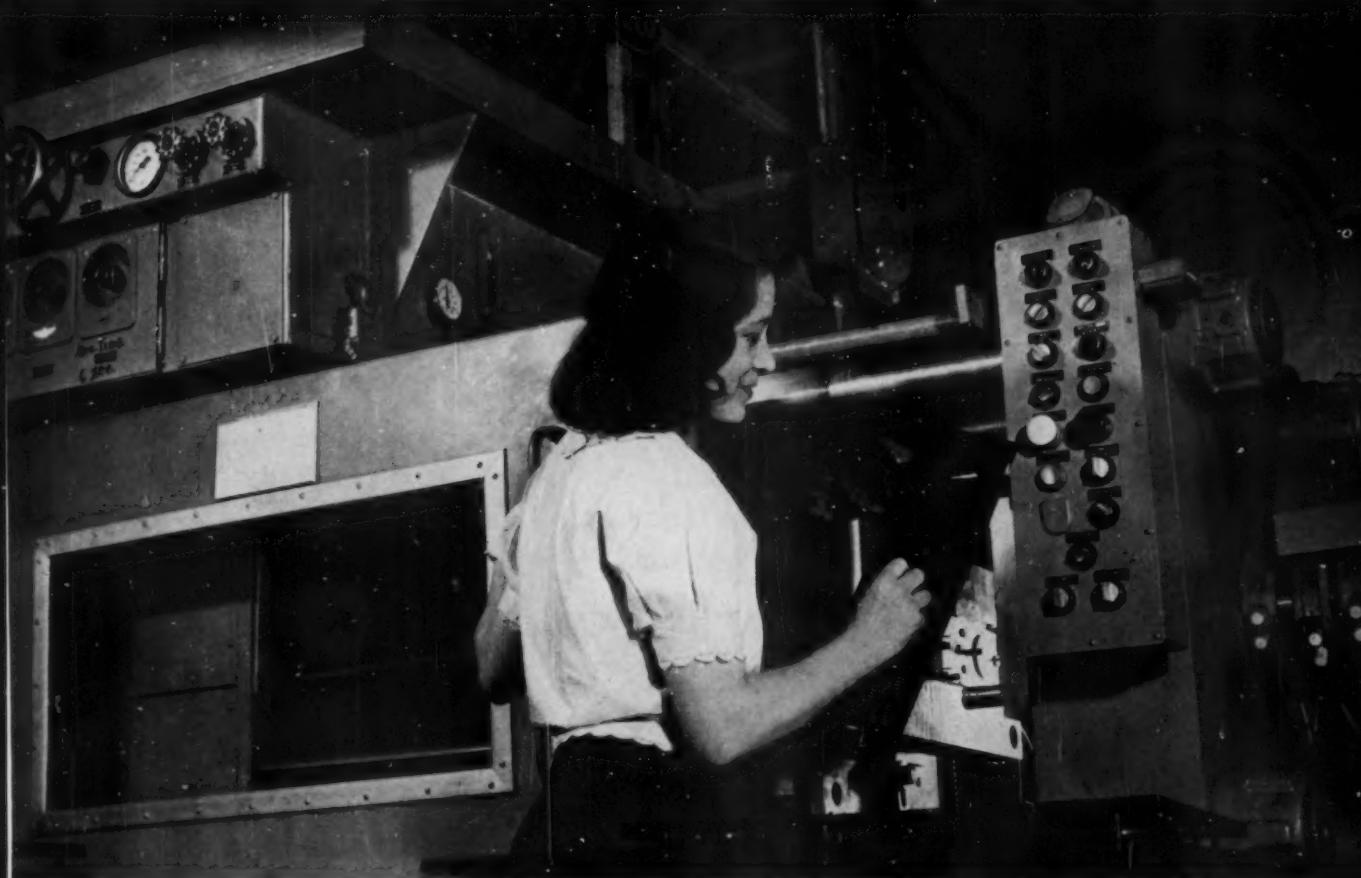


tape & label co.

***NEW YORK** (DUmONT, NEW JERSEY)
105 W. Shore Ave., DUmONT 5-4200
CHICAGO
205 W. Wacker, Rm. 209, CEntral 6-0421
ST. LOUIS
1455 Page Industrial, HArrison 9-7700
DALLAS
318 North Pearl St., Riverside 7-8550
SAN FRANCISCO
26 O'Farrell, Suite 306, SUtter 1-6923
LOS ANGELES
521 N. La Brea Ave., WEbster 8-2134

A DIVISION OF EUREKA SPECIALTY PRINTING CO.

SCRANTON, PA.



High Gloss, High Impact TV Control Panel Molding on a Natco 300.

"Even the controls were designed with the molder in mind"

Said Steve Edlis, Vice President of General Die Mold.



"Pressure, temperature and timer controls are in a convenient central location on our Natcos. We don't have to run from one end of the machines to the other in making adjustments."

Mr. Edlis of General Die Mold Company, Chicago, further commented that "With Natco's hydraulic system even the cooling water consumption is low. Our industrial water service is expensive and as we add equipment this amounts to a real saving."

"We have found that our Natcos' injection hydraulic system provides us with independent and precise control of pressure drop-off and plunger speed. This allows us to get rid of sink marks and still not have any ejection problems."

Write for Natco Catalog 2001 for more information.

NATCO

THE MOLDER'S
MOLDING MACHINE

NATIONAL AUTOMATIC TOOL COMPANY, INC.
PLASTICS MACHINERY DIVISION
RICHMOND, INDIANA, U. S. A.



Powell Invert-a-bin® can be tumbled, vibrated and aerated!

The most difficult of materials can now be semi-bulk handled. Ideal for in-plant and inter-plant handling. Fine materials such as chalk, clay, cement, whiting, polyvinyl chloride, titanium dioxide, talc, etc., which pack and densify in transit and storage, can now be handled with ease in the Invert-a-bin®.

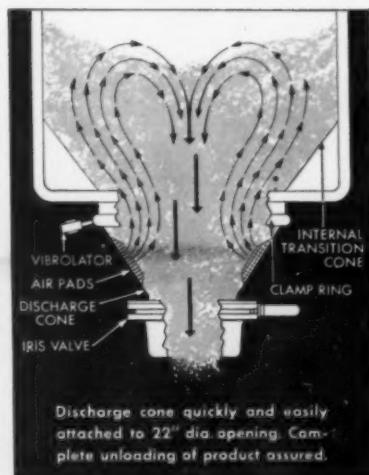
The ability to rotate or tumble the Invert-a-bin® in the sling type, floor type, or lift-truck grab attachment just prior to discharge restores material to flowable condition. Flowability is further improved by aeration and vibration attachments on the discharge cone—also a partially filled Invert-a-bin® can easily be taken off stream.

Should you be having handling problems with your products, send us a sample for our recommendation. Invert-a-bin® could be your answer to reducing handling costs.

Our Invert-a-bin® sales manager, Lew Lubenow, or our representative in your area is available to assist you in making an engineering and economic survey.



THE POWELL PRESSED STEEL COMPANY
Lic. under pat. #2862645 300 ERIE ST. • HUBBARD, OHIO



NEW DESIGNS IN MARLEX



“Versatile is the word for MARLEX®”

An unbreakable, lightweight dinghy . . . durable school furniture . . . traveling case . . . corrosion-proof water softener tank . . . crack resistant coated wire . . . rope that floats . . . detergent bottles . . . housewares . . . boilable frozen food packages . . . baby bottles . . . thick and thin packaging wraps and bags . . . stain-proof, durable rugs and fabrics . . . acid resistant, flexible and corrosion-proof pipe and tubing . . . non-conducting electrical conduit . . . biologically inert surgical gauze!

These and the other items shown above are a recent sampling of the wide variety of products made with MARLEX high density polyethylenes, ethylene copolymers, and Tailored Resins. In each case, MARLEX was chosen

because its use either improved the product or achieved equal quality at less cost.

MARLEX is tough . . . rigid . . . colorful . . . strong . . . lightweight . . . non-allergenic . . . unbreakable . . . resistant to chemicals, oil, greases, rust, rot, corrosion, heat and cold (250°F to -180°F). MARLEX items can be injection molded, thermoformed, extruded . . . machined, welded, and printed upon. In fact, no other type of material serves so well and so economically in so many different applications.

Perhaps MARLEX can serve you! If interested, contact us for further details and technical data on available MARLEX resins.

*MARLEX is a trademark for Phillips family of olefin polymers.

PHILLIPS CHEMICAL COMPANY, Bartlesville, Oklahoma, a subsidiary of Phillips Petroleum Company.

PLASTICS DIVISION OFFICES

NEW ENGLAND

322 Waterman Avenue
East Providence 14, R. I.
GEneva 4-7600

NEW YORK

NEW YORK
80 Broadway, Suite
New York 5, N. Y.
Digby 4-3480

AKRO

318 Water Street
Akron 8, Ohio
Franklin 6-4126

CHICAGO

111 S. York Street
Elmhurst, Ill.
TERrace 4-6600

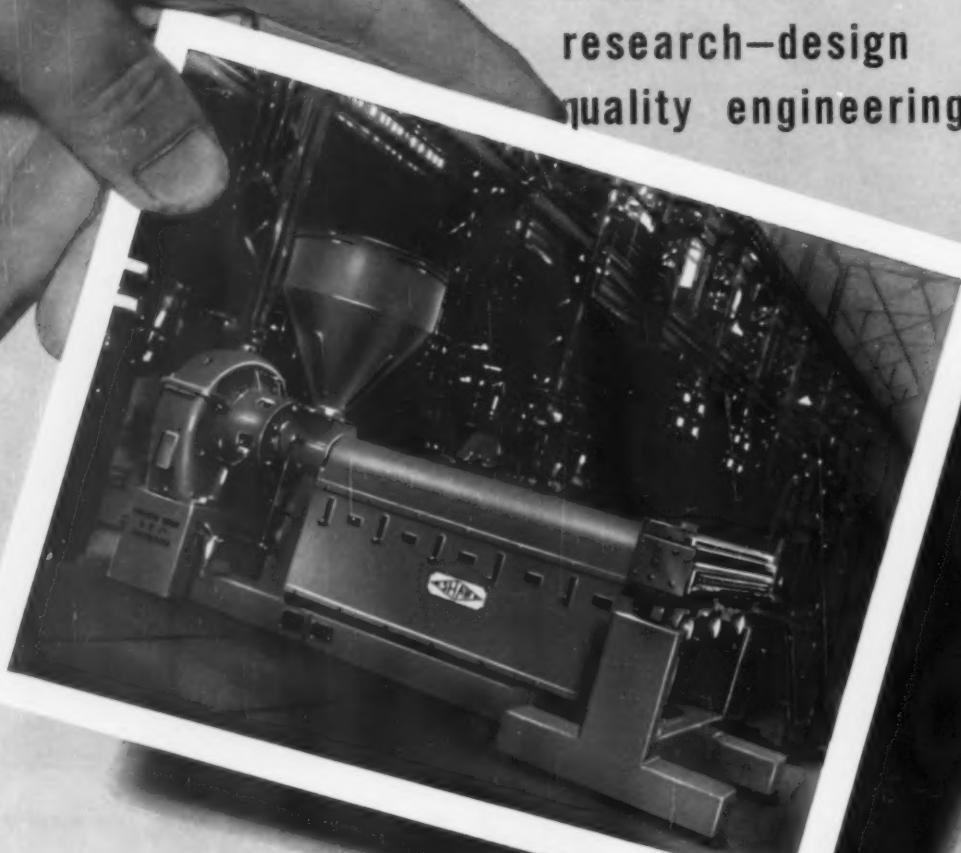
WESTERN

WESTERN 317 N. Lake Ave. Pasadena, Calif. MURray 1-6997	SOUTHERN 6010 Sherry Lane Dallas 25, Texas EMerson 8-1358
--	--



EXPORT: PHILLIPS PETROLEUM INTERNATIONAL CORPORATION • P. O. Box 7239, Panama City, Panama • Summetrasstrasse 27, Zurich 6, Switzerland

behind every
Francis Shaw
machine
research-design
quality engineering



Constant research and development, close co-operation with users, advanced design, selected high quality materials . . .

These, coupled with long experience, help to create processing machinery of unrivalled performance.

The new range of Francis Shaw Plastic Extruders is designed for end products in all thermoplastic materials including Polystyrene, Polyethylene and P.V.C. in plasticised or rigid form.

- * **Extrusion in sheet, tube, film or solid sections**
- * **Engineered for consistent performance**
- * **Modern heating and cooling control**
- * **Special design of dies and complete auxiliary equipment**



Francis Shaw

FRANCIS SHAW & COMPANY LIMITED · MANCHESTER 11 · ENGLAND
TELEGRAMS: "CALENDER" MANCHESTER · TELEPHONE: EAST 1313 · TELEX: 66-357

London Office: 22 Great Smith Street London SW1 · Telephone: Abbey 3245 · Telegrams: Vibrate London · Telex: 22250
Canada: Francis Shaw (Canada) Ltd Grahams Lane Burlington Ontario · Telephone: Nelson 4-2350
Telegrams: Calender Burlington Ontario · Telex: Canada Calender Hamilton 021/682

OVERSEAS AGENTS THROUGHOUT THE WORLD

P4397

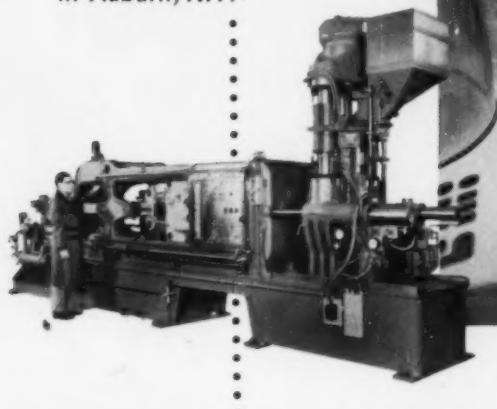
**"These Quality
Parts run best
on our new
24/32 ounce
LESTER..."**

NO WELDS...

NO FLASH...

**...just
perfect
finish!"**

*So says Mr. L. A. Lynch (right),
superintendent at
Auburn Plastics, Inc.,
in Auburn, N.Y.*



"For example, we had been running this Remington adding machine cover on another machine, with considerable trouble over a weld mark on the front wall of the part. We worked hard to correct this, modifying the mold, trying various materials, and finally raising mold and material temperatures and lengthening the cycle."

Mr. E. F. Baran (left), general foreman, continues. "Then we put it on the new 24/32 ounce Lester. It took off! Lower temperatures, no weld or flash, and just the right finish to please our customer... not to mention a distinct improvement in the cycle."



We really don't know the maximum plasticizing capacity of this new Lester...we haven't hit bottom yet. And we're particularly pleased with its sensible range of controls in cycling speed, mold stroke adjustment and heat control."



*Complete 4-page spec sheets on the
new long-stroke L-450-24/32 ounce
Lester are available on request.*

LESTER-PHOENIX, INC.

2621-W CHURCH AVENUE • CLEVELAND 13, OHIO

Agents in principal cities throughout the world





Joe Foster, President,
suggests the range of
Foster Grant's
engineering services.

**"Design molds for
a resin customer?
Sure, and we'll
production-prove
them for you, too,"
says Joe Foster.**

Not that designing molds is our business.

Basically, we're suppliers of polystyrene, impact polystyrene and Nylon 6 resins, and we're also the world's largest manufacturer of sunglasses. But quite often a customer takes us up on our standing offer—of technical assistance in any area, from materials and machines to packaging and marketing.

Take last Fall, for instance. One of our customers was in Leominster, so we invited him to drop over and see our facilities. He molds combs, and one glance convinced him that some of our ideas might make his operation more productive.

We then offered to furnish him an improved mold, designed for his needs and tested by us **on his own machines**. Result—he now gets 16 combs per "shot" instead of 8, semi-automatic instead of hand degating, and a 26% shorter cycling time. No more grinding or buffing, either...for a yearly saving of more than \$100,000!

Why not see if our engineering services can help you. Call or write us today. Foster Grant Co., Inc., Leominster, Mass., KEstone 4-6511.

FC
FOSTER GRANT

Your Partner in Plastics Progress

Plants in Leominster, Mass., Manchester, N. H., Baton Rouge, La.
Branch Offices and Warehouses in principal cities

**In Denmark, too, the brightest,
most eye-catching signs are made
from 'Perspex'**



INTERNAL ILLUMINATED SIGNS made from 'Perspex' by Colorlux, Esbjerg, Denmark. CIGAR BOX made from clear 'Perspex' lacquered with 'Cerric' acrylic paints. Letters either side of the box are made of 'Darvic' p.v.c. sheet.

FIONA TAPET SIGN has a background of corrugated 'Perspex', with lettering in 'Perspex'. MARIETTA SIGN made from 'Perspex'. 'EDELWEISS' SIGN made from 'Perspex'.



SHOPS WITH SIGNS made from 'Perspex' acrylic sheet do better business—because 'Perspex' is bright, gay and attracts custom. In Denmark, as in so many countries, the best signs are made from 'Perspex'.

'Perspex' can be internally illuminated; it is the ideal

material for both exterior and interior signs. 'Perspex' retains its good looks regardless of weather conditions and atmospheric corrosion, and is easily cleaned. An exciting range of colours is available in transparent, translucent and opaque sheet. Opal and clear 'Perspex' are also available.

PERSPEX

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.

Imperial Chemical Industries Limited, Plastics Division: Export Dept., Black Fan Road, Welwyn Garden City, Herts.
U.S.A. enquiries to: J. B. Henriques Inc., 521 Fifth Avenue,
New York 17, N.Y.
P739 0.A.

Canadian enquiries to: Canadian Industries Ltd., Plastics Division, Box 10, Montreal P.Q.



There's a **MINI-JECTION**

Reg. U.S. Pat. Off.
PLASTIC INJECTION MOLDING MACHINE
to fit your needs!

Among the 3 basic models and 10 different MINI-JECTION machines, there's one to meet your precise plastic injection requirements, from sub-miniature to 1½ oz.

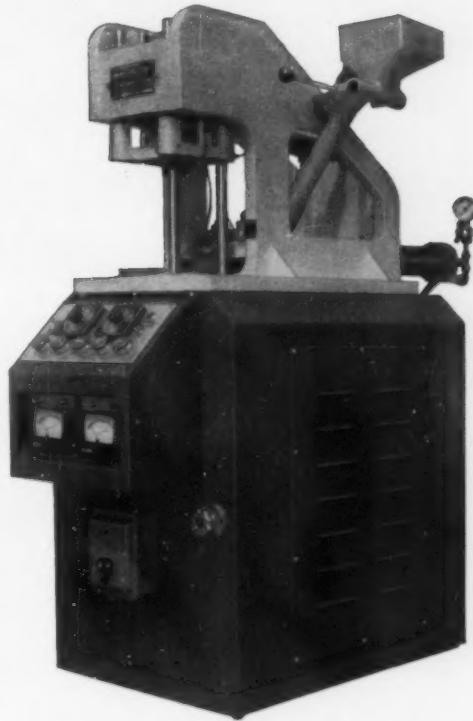
Choose hydraulic or air power — vertical or horizontal clamping—molds bolted to platens or self-locking "V" molds—machines designed especially for precision molding of parts involving inserts or loose cores — for economical high-speed production or short or moderate runs.

MINI-JECTIONS mold *all* thermoplastics — and do it quicker, better and for less!

Models start under \$1,000 complete.

SEND FOR FREE CATALOG—NOW!

New, useful, illustrated. Shows fast, low-cost way to develop and produce precision molded items in all thermoplastics. Detailed engineering data, specifications, applications on all MINI-JECTION models. Complete price list. Shows how to cut your injection molding costs. Mail coupon today!



Super ELDORADO MINI-JECTION
(Semi-automatic)

Model 95VC105

designed especially for molding items involving inserts or loose cores. No front tie rods to hinder free access to mold when it is open.

NEWBURY INDUSTRIES, INC.

Box 61, Newbury, Ohio

Please send me your FREE Catalog.

NAME

COMPANY

ADDRESS

CITY STATE

For convenience attach to your letterhead and mail.

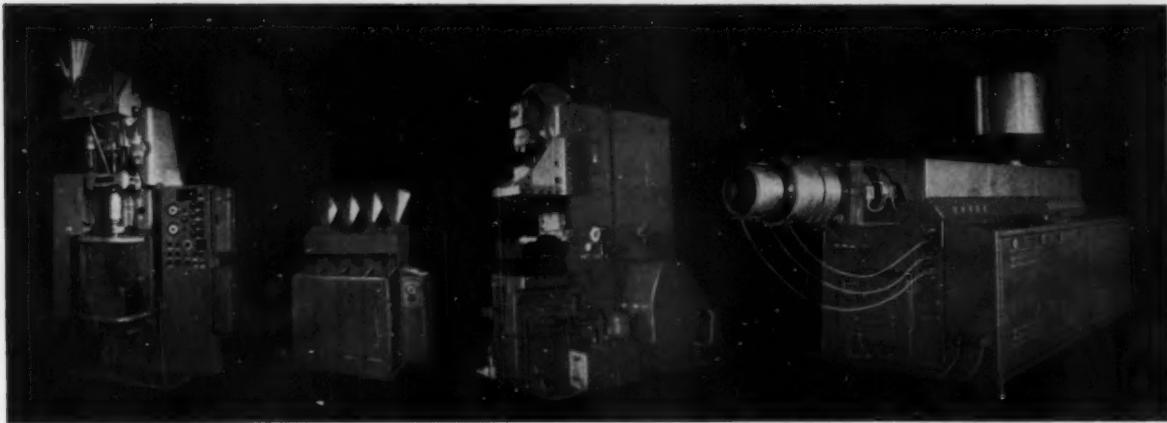


for
plastics
machinery
contact

BATTENFELD

we deliver
the complete
line

of equipment for
INJECTION
MOLDING
COMPRESSION
MOLDING
TRANSFER
MOLDING
BLOW MOLDING
EXTRUSION



Blow Molding Machines
with piston and screw feed
up to 215 pts

Automatic Serial Presses
for screw caps etc.

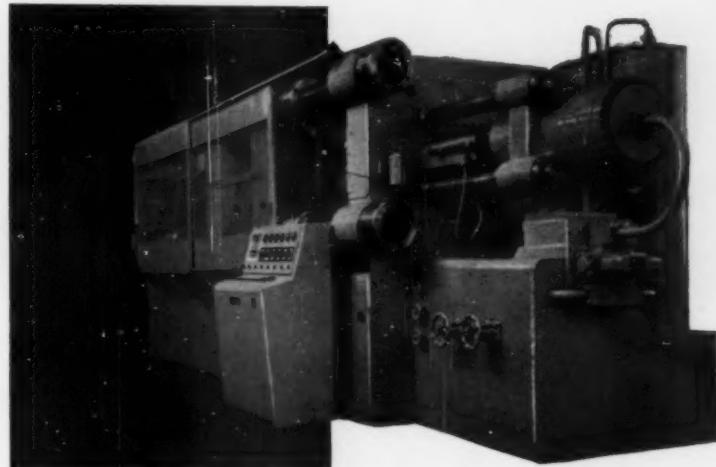
**Compression and Transfer
Molding Machines**
up to 300 tons capacity

**Extruders and complete
Automatic Plants**
(with screw diameters
1 1/4" 1 3/4" 2 1/2" 3 1/2" and 6" approx)

INJECTION MOLDING MACHINES

from 1/10 oz. upwards

**with
SCREW PLASTICIZING
UNIT**
from 1 – 350 OZS



BATTENFELD

CORPORATION OF AMERICA

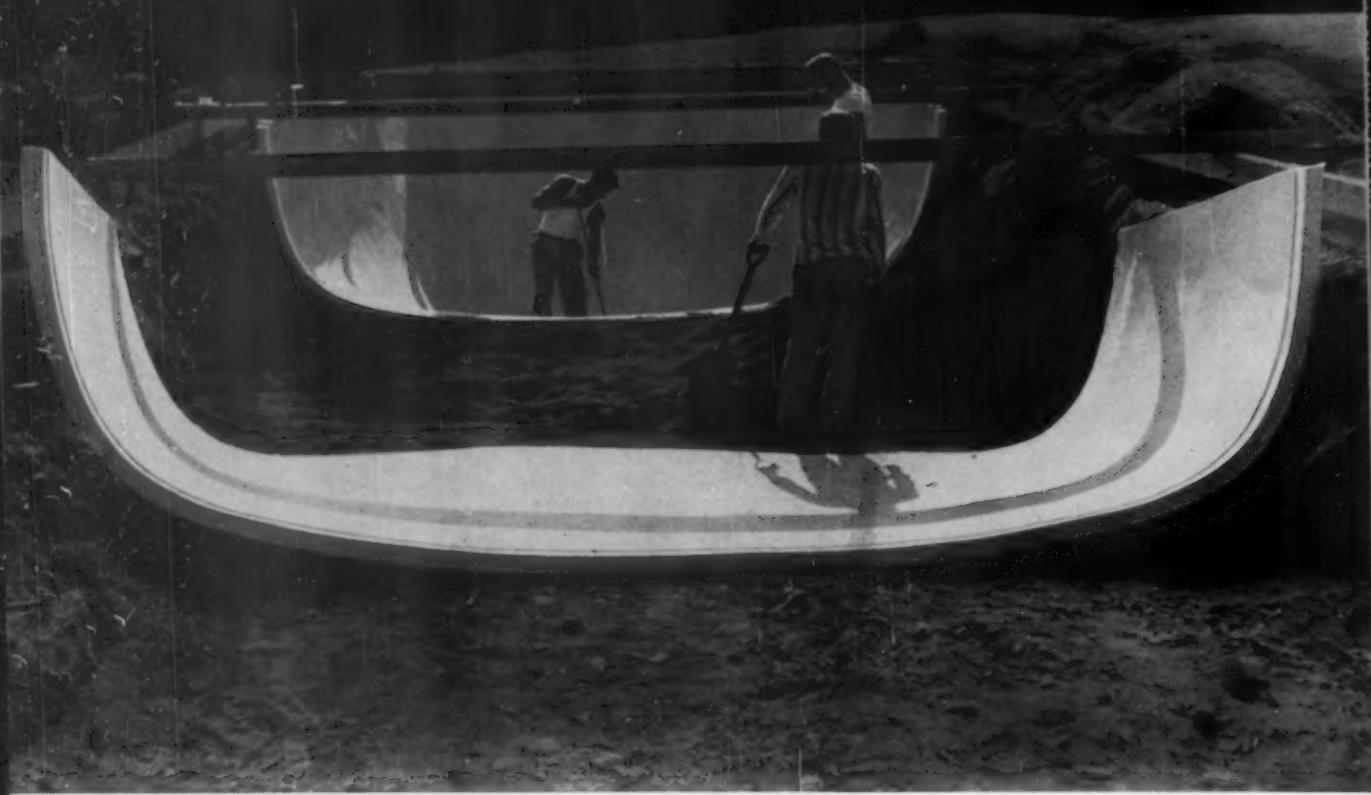
959 W. Grace Street

CHICAGO 13, ILL.

Main Office and Plant
BATTENFELD MASCHINENFABRIKEN GMBH
Meinerzhagen/Westf., GERMANY

with Sales and Service-Organisations in

ENGLAND: Battenfeld (England) Ltd., Great South West Road, Bedfont, Feltham, Middx.
AUSTRALIA: W. J. HANDEL & Co., Pty., Ltd., 17 Paramatta Road, HABERFIELD, SYDNEY



Installation photo courtesy Lancer Pools Corp.

Shipshape pools with GLIDPOL Resins

Reinforced plastic pools by Lancer, world's largest manufacturer of plastic swimming pools, are designed for carefree enjoyment with GLIDPOL GEL-KOTE and GLIDPOL lay-up resins.

GLIDPOL GEL-KOTE, a Glidden pigmented polyester resin available in varied colors, provides smooth, porcelain-like surfaces which minimize maintenance—do not require painting. They resist the adhesion of algae and the harmful effects of sun, chemicals, heat or freezing cold as well.

GLIDPOL lay-up resins, reinforced with glass fibers, back up the GEL-KOTE to give Lancer Pools their structural strength.

From swimming pools to bathtubs, both GLIDPOL GEL-KOTE and GLIDPOL lay-up resins help make reinforced plastic products more saleable. Write for complete information on the GLIDPOL polyester resin system best suited to meet your particular requirements.



GLIDPOL POLYESTER RESINS

The Glidden Company

INDUSTRIAL PAINT DIVISION

900 Union Commerce Building • Cleveland 14, Ohio

In Canada: The Glidden Company, Ltd., Toronto, Ontario

There's a GLIDPOL Polyester Resin system, plus Glidden Technical Service, to help you do it better, more economically, whatever your product, process or problem.

Breakthrough!

New kind of stretchable decorative "foil" successfully used in molding deep-draw melamine pitchers, cups and industrial items—New "foils" also successful in reproducing full-color, black and white photographs. Developments open an exciting new era for melamine, urea products, and even combinations with certain phenolics.

Ornapress A. G. of Switzerland, pioneer in the development of melamine decorative "foils" for dinnerware, and perfecter of the deep-draw process, has now successfully employed a new type of stretchable "foil" in the molding of deep-draw pitchers, beer mugs, ash trays, cups, dials and a host of industrial products. Additionally, Ornapress and Fairhaven Properties Corporation—in a joint collaboration based on pooling of patents and know-how—have reproduced in "foils", full-color photographs for molding into various items. They have also discovered an economical means of reproducing black and white photographs for molding into plaques, hot plates, souvenir, and many other products. The implications of these developments are literally breath-taking. They promise veritable revolutions in the manufacture and sale of "foil" decorated tableware, souvenirs, signs and industrial items.



Argentina

* Plasticos Argentina,
Buenos Aires
** FAPI, Buenos Aires

Australia

* British Plastics, Hawthorn

Austria

* Schmidberger A.G., Vienna

Belgium

* Cogébi S.A., Lot-les-Bruxelles

Brazil

* ORNAMIN-Plasticos,
Sao Paulo

Canada

* General Plastics, Cookshire

Egypt

* S.N.M.P., Cairo

England

* ORNAMIN (U.K.),

Northampton

* Craxfords, London

Finland

* Sarvis O.Y., Tampere

France

* Ornafrance, Annecy

Germany

* ORNAMIN G.m.b.H.,

Minden

* ORNAMIN-Presswerk,

Minden

* Presswerk Köngen,

Köngen

Israel

* Tamah, Mishmar Haemek

Italy

* SAMPA, Borgomanero

Japan

* TOYO KOATSU, Tokyo

Peru

* PLASTO, Lima

Portugal

* LUSO SINTETICA,

Lisbon

South Africa

* Luminescent,
Johannesburg

Spain

* IBERIA, Barcelona

Sweden

* Roerstrand, Lidköping

Yugoslavia

* ME-BA, Zagreb

* = molding

** = foils production

ORNAPRESS A.G.

Gerechtigkeitsgasse 25, Zurich, Switzerland

Owner of Ornamin decorating processes and patents.
Foil production. Molding. Molds manufacture.

Announcing

another
Shell Chemical
service for
paint makers...

Epon® Resin in ready-to-use solutions

You save valuable time when you buy Epon resin solutions, because weighing, compounding, filtering, and standardizing are done for you right at the Shell Chemical plant.

Epon resin solutions come to you ready-to-use, with the solvent and solids content standardized. You save on handling time, too, because Epon resin solutions can be pumped with ordinary equipment. These solutions may be integrated into time-tested coating formulations, eliminating the need for costly experimentation in your own laboratories.

If you do not find the Epon resin solutions you need in the table, perhaps we can compound one to your exact requirements after we analyze your problem. Get complete information by phoning or writing your nearest Shell Chemical district office.

EPON RESIN SOLUTION	RESIN	SOLVENT	% SOLIDS
Epon 834-X-90	834	Xylene	90
Epon 836-C-75	836	MIBK	75
Epon 1001-A-80	1001	Acetone	80
Epon 1001-B-80	1001	MEK	80
Epon 1001-BT-70	1001	MEK/Toluene (50/50)	70
Epon 1001-CX-75	1001	MIBK/Xylene (65/35)	75
Epon 1001-T-75	1001	Toluene	75
Epon 1001-X-75	1001	Xylene	75
Epon 1007-CT-55	1007	MIBK/Toluene (50/50)	55

SHELL CHEMICAL COMPANY PLASTICS AND RESINS DIVISION

Central District
6054 West Touhy Avenue
Chicago 48, Illinois

East Central District
20575 Center Ridge Road
Cleveland 16, Ohio

Eastern District
42-76 Main Street
Flushing 55, New York

Western District
10642 Downey Avenue
Downey, California

IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited, Toronto



THE PLASTISCOPE*

News and interpretations of the news

By R. L. Van Boskirk

Section 1

June 1960

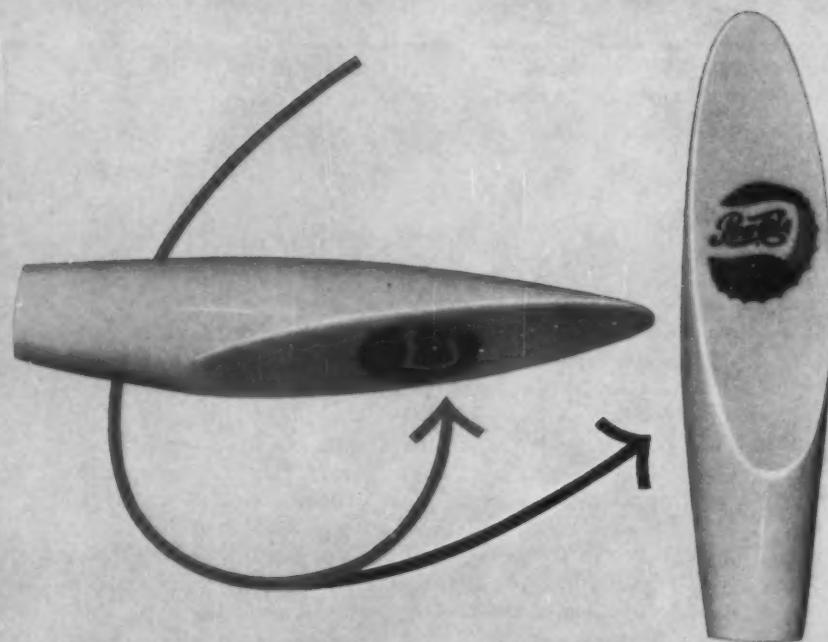
New entrant in isocyanate field. In spite of the consistent and rapid growth of urethane foams since they were first introduced commercially about five years ago, no new suppliers of isocyanates—the basic ingredient for urethane foams, coatings, and elastomers—had been tempted to compete with the three original producers of toluene diisocyanate (TDI)—Mobay, Du Pont, and National Aniline Div. of Allied Chemical. Part of the reason lies in the complicated process, which consists of nitration of toluene to dinitrotoluene, catalytic hydrogenation to diaminotoluene, and reaction with phosgene to yield TDI. Now Nopco Chemical Co., Newark, N. J., a producer of flexible urethane foam and supplier of prepolymers, has announced plans to construct a TDI plant with a capacity of 10 million lb. at a cost of approximately \$7 million, scheduled to be in production by January 1962. The combined capacities of the three current producers of TDI are around 50 to 60 million lb., with sales expected to reach close to 40 million lb. by the end of the year. Although the additional 10 million lb. capacity planned by Nopco will be needed by 1962, Mobay, Du Pont, and Allied have kept TDI production well ahead of sales, and are expected to announce further expansion plans this year.

Industry capacity for isocyanate. Nopco's announced capacity is thought to be a minimum for economic production, even at the present price level of 70¢/lb., and a 50¢ to 55¢ level may not be far off. Nopco expects that captive consumption will be such that the plant can begin operation at a high level of production. Since TDI content in urethane foam formulations averages about 30%, this would mean that the company plans to sell between 20 and 30 million lb. of foam—compared with an estimated 5 million lb. it now produces.

Almost simultaneously with Nopco's announcement, Allied revealed the availability of a new grade of TDI, designed especially for rigid foams and selling at 60¢/lb. Called Nacconate 4040, the new grade is expected to give big impetus to the use of urethane foams in the refrigeration industry and in panel making. The availability of this lower cost isocyanate now completes the replacement of all the ingredients formerly used to make rigid foams, by much less expensive materials. Now rigid foams will be made with polyethers instead of polyesters; by the one-shot method instead of the prepolymer techniques; and with the use of fluorinated hydrocarbons (Freon, Genetron, Ucon, and Isotron), which provides about twice the insulating efficiency of the earlier types of urethane foams. So far, rigid foams, mainly for refrigeration account for 10 to 15% of the estimated 110 million lb. urethane foam market for 1960. Allied expects Nacconate 4040 will sharply increase that percentage.

Price reduction for nylon. Allied Chemical reduced the price on nylon molding material from \$1.18 to \$1.11 on May 19 "to make it fully competitive with formaldehyde polymers," according to the press release. Allied's (To page 43)

*Reg. U. S. Pat Off.



Another way to make folks say, "Make mine a Pepsi"

Photographs can't do justice to the beauty, utility and durability of this Pepsi-Cola dispenser handle. Molded of gleaming white melamine with the famous red, white and blue Pepsi bottle cap in permanent molded-in color, it provides that all-important instant identification to the thirsty millions who prefer this popular beverage. Handsome, yes, plus all the strength and rigidity needed to meet the rigorous demands of fountain service.

The Pepsi handle is not an ordinary molding job. In fact, it involves some rather unusual techniques which come only with years of experience. And that is, of course, a mighty good reason to specify CMPC on your next job.



This is another CMPC "White Gloves" molding. For maximum protection against material contamination, this product was molded under highly controlled production conditions involving special dust control measures and a protective materials handling system. This is another example of CMPC's specialized techniques and facilities for producing the best in molded plastics.

CMPC

CHICAGO MOLDED PRODUCTS CORPORATION

1020 A North Kelmar Avenue
Chicago 51, Illinois

THE PLASTISCOPE

(Continued from page 41)

polymer, nylon 6, is made from caprolactam, as is that produced by Foster Grant and Spencer, who quickly followed the Allied action with a similar reduction. Du Pont, who also makes a caprolactam polymer, Zytel 211, but whose chief item is Zytel 101, the original general-purpose nylon 6/6 American-type (caprolactam types are more universal in Europe) followed the pattern and also reduced the price of most of its nylons, except for Zytel 69, 61, and 63, which are specialty types for such things as wire coating and sell for from \$1.68 to \$2.18 a pound.

The polymer mentioned above is, of course, Du Pont's acetal resin Delrin, which was selling for 88¢, but will now very likely be reduced by a nickel or so to keep it slightly under nylon. The difference is accounted for by specific gravity. Delrin is being promoted primarily as competition for metals, but there is no doubt that it also fits into a variety of nylon applications.

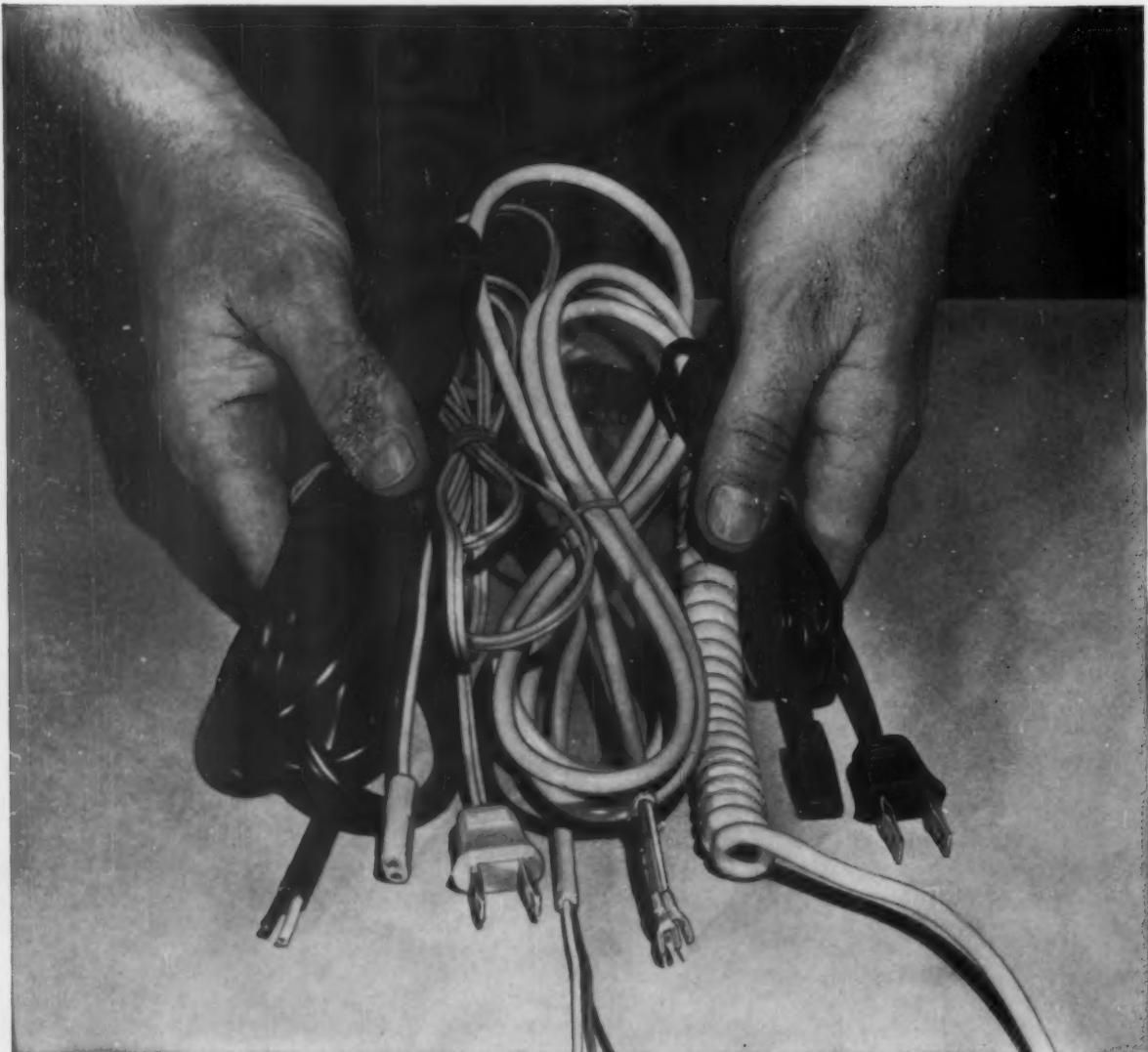
Giant chemical complex. A \$50 million complex to convert hydrocarbons from gas or liquid fuel into acetylene and vinyl chloride monomer has been announced as a joint enterprise by The Borden Co. and United States Rubber Co. The site will be chosen at some location between Southeastern Louisiana and Corpus Christi, Texas, and is planned to begin operation in 1962, according to the two companies.

The enterprise will be called Monochem Inc. Both companies will erect adjacent individually owned plants, which will use the vinyl chloride, acetylene, or acetylene-derived products. The Monochem plant will be designed to produce more than 80 million lb. of acetylene and 150 million lb. of vinyl chloride monomer, which is a lot more than the consumption of these two vinyl chloride polymer producers today.

Red—bright or pale. A comparatively new red pigment (it's only two years old) is attracting a lot of attention in the plastics industry. Automotive firms took most of what was available last year, which means it had to have "oomph." Strangely enough, these pigments are at their very best in pastels, where fading has always been a particularly bad problem. The secret of pastel excellence is claimed to be that "even a little pigment goes a long way toward producing durable colors."

The new pigments are called Monastral by Du Pont. Uses in plastics include wall fabrics, floor coverings, table covers that will withstand washings, plastics signs, and garden hose. Pink and flame color, from Monastral, for plastics boats are said to be as lightfast as tints, resistant to alkali, heat, and salt water. The plastics industry's #1 appeal is probably color—and red is the leading hue. If there is one that never fades, it will be appreciated profitably as well as aesthetically.

National Sanitation Foundation approval. Penton, the resin developed from pentaerythritol by Hercules Powder Co. and noted particularly for low-shrinkage, high heat and chemical resistance, has been granted an NSF Seal of Approval for meeting the Foundation's requirements for use in products requiring nontoxicity. This approval is expected to lead to applica- (To page 45)



Need a quality resin accepted and approved for electrical applications?

VYGEN 120 PVC resin is UL-approved as interchangeable with other quality PVC resins for wire insulating applications. VYGEN 120 is specially formulated for fast economical dry-blend extruding, with monomeric or polymeric plasticizers. It assures a lack of gelled particles... provides excellent heat and light stability plus exceptionally long life. See how VYGEN can help your products... speed your production... send for complete technical literature today!

THE GENERAL TIRE & RUBBER COMPANY Chemical Division · Akron, Ohio

Chemicals for the rubber, paint, paper, textile, plastics and other industries: GENTRO SBR rubber GENTRO-JET black masterbatch • GEN-FLO styrene-butadiene latex • GEN-TAC vinyl pyridine latex GENTHANE polyurethane elastomer • ACRI-FLO styrene-acrylic latex • VYGEN PVC resins • KURE-BLEND TMTO masterbatch • KO-BLEND insoluble sulfur masterbatch

VYGEN®

VYGEN 85 — Recommended for calendering, extrusion and molding operations where processing at low temperatures is desired.

VYGEN 105 — For light embossed sheeting and for molded items and extrusions requiring high gloss finish.

VYGEN 110 — General-purpose resin for calendered film, sheeting and coated fabrics, molding and extruding. Excellent heat and light stability.

*Creating Progress
Through Chemistry*



THE PLASTISCOPE

(Continued from page 43)

tions in water meters and sanitary equipment parts. The price has just been reduced to \$2.50 a lb.—was formerly \$3.50—and material is now also available for dispersion as well as moldings.

Pro-fax, the Hercules polypropylene, which was the first PP to receive Food & Drug Administration approval, is also now approved by NSF and is used for hot water dip-tubes and insert fittings for plastic pipe. Hi-fax, the company's high-density polyethylene, was also approved by NSF after five years of testing for potable water pipe.

Price juggling in vinyl chloride. Declines in vinyl chloride prices have been going on for several months, after most people thought that the 23½¢ price set in 1959 would prove stable for a long period of time. As we go to press, the price is 22¢ for general purpose resin. The perceptible reason is stiff competition in an industry that has more capacity than it has sales. Foreign imports of resin were less than 15 million lb. in 1959—9.6 million from Italy, 2.5 from Japan, and 1.5 from Canada. There is no sense in blaming the price decline on an import of 15 million when something like 850 million lb. of domestic resin were consumed. The matter of imported finished vinyl products could be much more serious if it continues to grow.

The biggest outlet for general purpose vinyl is calendering grade, with a market of around 200 million lb. a year. Some 40 to 45 million of this is calender-coated material. Paste or plastisol coated (spread coating) fabric must sometimes compete with this. So down comes the price of plastisol resin from 26½ to 25½ cents.

Unplasticized vinyl prices. The price of unplasticized vinyl resin compound was also reduced a month or so ago to 37½¢ from a previous 40½¢/lb. The reason was probably price competition from other thermoplastics. Between 18 and 20 million lb. of unplasticized vinyl resin were used for extrusion in 1959. Somewhere around 14 million were for pipe and tubing—the balance was in extruded shapes like window frames, flashing, etc. It is expected that the new Goodrich Hi-Temp Geon resin, polyvinyl dichloride, which will convey water at over 200° F. under normal pressure, will enlarge this field. A sales price has not yet been established for the new material when it becomes available in large quantities.

How much vinyl in 1960? Volume of all vinyl resin consumed in the first quarter of 1960 is still 10% over 1959—an estimated 215 million lb. or more, against 192 to 195. But that 215-million-lb. figure is under the 225- or 230-million lb. figure in the last quarter of 1959. However, that quarter included a record breaking 82-million-lb. month in October. The first months of 1960 are each about the same as the last two months of 1959, or in the neighborhood of 70 million lb. a month. But March was back up to 77 million pounds.

Industry estimates for 1960 are for a volume consumption of around 950 million lb., in contrast with 860 in 1959. This is not equal to the 200-million-lb. increase in 1959 over 1958, but it's a long step toward that 1 billion lb. figure volume-resin producers dream about. (To page 47)



7548-A

No matter what your product, process or problem involving white pigmentation, look to TITANOX® pigments and our technical service for the answer. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities. In Canada: Canadian Titanium Pigments Ltd., Montreal.

THE PLASTISCOPE

(Continued from page 45)

Polyethylene in 1960. Polyethylene consumption in the first quarter of 1960 was approximately 280 million pounds. This was probably 10 million lb. or so under the last quarter of 1959. The Tariff Commission figures for 1959 are somewhat confusing, since one company reported an error of 20 or 30 million lb. in sales volume, which was added on at the close of the year but did not show up in any of the monthly reports. However, the 280-million-lb. figure for the first quarter of 1960 is from 25 to 30 million lb. more than the sales volume reported in the first quarter of 1959.

But the first two months of 1959 were the lowest of the year at around 80 million lb. each. From then on the industry consumed resin at from around 90 to over 100 million lb. a month. Therefore, polyethylene must be consumed at an average of over 100 million a month in 1960 if it is going to show anywhere near the same increase in 1960 that it did in 1959; namely, close to 250 million. Thus if the industry is to sell 1,350,000,000 lb. in 1960, the monthly rate will have to average over 112 million pounds. The rates so far in 1960 have been: Jan., 84; Feb., 95; March, 101.

Polyvinylidene chloride latex coating resin. National Starch & Chemical has announced a polyvinylidene chloride latex system that results in a coating said to be competitive with polyethylene for materials such as paper, paperboard, corrugated liner board, other plastic film, etc. The resin is a water dispersion and is supplied at 50% solids. It is called Resyn 3600.

It is said to differ from other vinylidene chloride emulsions used for film and paper coating in that it is internally plasticized and, therefore, eliminates the need for plasticization by the processor. It is also claimed to be softer and more flexible than the coating sometimes used on cellophane, but this material is presently being pushed for paper and paperboard applications, rather than for film.

Markets include: 1) food packaging—milk containers, drinking cups, bread wraps, frozen food cartons, butter wraps—which could consume several million lb. annually; 2) industrial packaging—on kraft paper or corrugated liner board, for masking paper, hospital bags, cigarette packs, etc. Particularly intriguing is the possibility of packaging lube oils in such coated paper, which would be considerably cheaper than conventional metal cans. Non-packaging applications include textile coatings, vapor barrier for gypsum wall, base for adhesives. The coating is printable.

Cost is claimed to be less than polyethylene coating. Since Resyn 3600 is claimed to have three times the resistance to moisture vapor transmission than polyethylene, only one-third as much is required for a given area. It sells at 45¢ per dry lb. (22½ for emulsion) and 8 lb. of dry resin on a ream of 3000 sq. ft. of paper would give equivalent properties of 1 mil of polyethylene. A ream of paper would require 15 lb. of polyethylene for a 1 mil coating at 32½¢/lb. The price variation is therefore \$3.80 for Resyn 3600, compared with \$4.87 for PE, according to National Starch technicians.

Resyn 3600 will be produced at a new facility at National's Mecedosia, Ill. plant. Capacity, when the new unit is in production, is said to be 14 million lb./year.

For additional and more detailed news see Section 2, starting on p. 214

NEW MACHINERY-EQUIPMENT

Specifications, claims made, and prices appearing in these pages are those of the manufacturers or sellers of the machinery and equipment described, or their agents.*

Foam machine

Designed for the production of urethane, polyether and polyester foam, the Armorbelt continuous foaming machine consists of a wide metal belt conveyor in a truss support. It is pivoted at the pouring end and is equipped with a hand-wheel-operated raising mechanism to adjust the conveyor the correct downward slope for proper foaming. The pouring end is equipped with side fences to support the pouring paper. The spacing between fences is adjusted by a single handwheel. Provision is made in both conveyor and side fences for heating the foam blanket. A remote-controlled variable-speed drive allows the operator to change speed during operation. An automatic takeup compensates for temperature changes. The metal conveyor belt is zinc coated for easy cleaning. It runs on a steel track and is laterally guided by ball bearing rollers to prevent layer separation of the foam. The con-

veyor body is fully enclosed. The unit is 80 ft. long and has a working width of 80 in. with a minimum fence spacing of 24 inches. The fences are 30 ft. long, with an additional removable 10-ft. section in the foaming head area. M-H Standard Corp., 517 Communipaw Ave., Jersey City 4, N. J.

Injection machines

Reciprocating screw injection machines can be supplied with four different screw sizes and five different cylinder sizes to suit individual processor needs. Thanks to the different cylinder and screw designs, shot capacities covering the range of 26 to 278 cu. in. are available. These machines are characterized by the use of a screw which also acts as an injection ram and moves axially within a single cylinder. Experience has indicated that this type of machine provides superior plastication of polymer melts compared to the conventional ram type machine

without preplastication equipment. The significant specifications of this line, which includes models V-40-550, V-74-550, and V-90-1000 are shown in the table, below. Machines have been developed in cooperation with Ankerwerke, who also produce reciprocating screw machines. Krauss-Maffei, A. G., München-Allach, Germany.

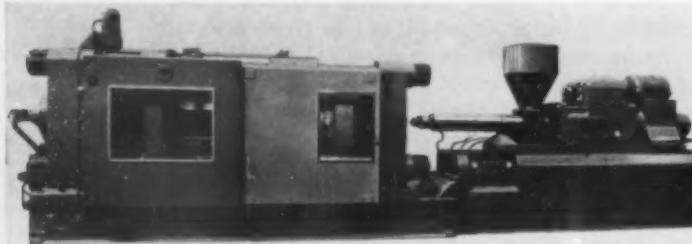
Extrude cutter

Model M-420 Wink cutters are especially suited to the precise cutting to lengths of extruded plastic materials and may easily be incorporated in a completely automated extrusion line. Special scissors-like knives are used. Cutting action may be continuous or intermittent, in adjustable lengths up to 60 ft. (or more on special request). Materials may be sliced as thin as $\frac{1}{16}$ in. in small-diameter stock. Extrudates up to 3-in. diameter can be handled. The machine will make an average of 200 to 1500 cuts/min., on a continuous basis, 3000 or more on some jobs; intermittent speeds range up to 225 cuts/min. The machine cuts to exact dimensions with little or no scrap or distortion of the piece. The cutters are available on lease, lease-purchase, or time payment plans. Mott & Merryweather Machinery Co., Wink Div., 1250 E. 222nd St., Cleveland 17, Ohio.

Cycle timer

In molding some plastics, it is necessary to release pressure for escape of volatiles, and then reapply pressure. This step is called bumping and may be required several times during the cycle. The E574S Robotron Time Cycle Controller regulates the spacing and number of bumps of a hydraulic press, the amount of press opening during each bump, the length of time delay before high pressure is admitted to the ram, and the total cycle time. High-capacity solenoid valves (supplied by Airmatic Valve Inc., 7313 Associate Ave., Cleveland 9, Ohio) that control air supplied to the press are mounted to the Robotron case at their electrical (To page 50)

KRAUSS-MAFFEI V-90-1000 reciprocating screw injection machine has typical piggyback drive mounting to turn injection screw.



Specifications: Krauss-Maffei injection machines

	V-40-550	V-74-550	V-90-1000
Injection volume, cu. in.*	26-73	58-165	95-278
Injection pressure, p.s.i. ^b	2700-18,500	2850-18,500	2850-18,500
Max. inj. rate, sec. ^c	3	4	5
Max. cycle, shots/hr.	130	120	100
Screw speed, r.p.m.	22-108	16-64	16-64
Plasticating cap., lb./hr. ^d	220	330	440
Clamp force, tons	640	640	1100
Daylight, in.	27 $\frac{1}{2}$	27 $\frac{1}{2}$	35 $\frac{1}{2}$
Platen size, in.*	52	52	63
Daylight between tie bars,* in.	33 $\frac{1}{2}$	33 $\frac{1}{2}$	41
Net weight, tons	33	35	55

*Range depends on the size of cylinder specified. ^bVariable within ranges shown. ^cTo deliver full cylinder of material. ^dIn general purpose polystyrene. *Platens are square.

*Prices are deemed to be F.O.B. sellers' plants (unless otherwise stated), are for "standard" models, and are subject to change without notice. The publishers and editors of **MODERN PLASTICS** do not warrant and do not assume any responsibility whatsoever for the correctness of the same, or otherwise.

Proof of Satisfaction!



Brighton Plastics re-ordered

VAN DORN presses again and again

Several years ago Brighton Plastics of Rochester installed a Van Dorn H-250 to produce nylon gears for electric clocks. They inject gears in a multiple cavity mold at a production rate of 5 shots per minute. The Van Dorn press performed so well that Brighton ordered another, and later still, a third.

Van Dorn presses mold nylon better because they insure:

1. Better material control
2. Easier maintenance of close tolerances

3. Lower mold investment
4. Less waste in purging
5. Automatic cycling

The outstanding features of Van Dorn presses for molding all thermoplastics are fully described in literature available upon request.



NEW MACHINERY

(From page 48)

connections. The wiring is protected and air connections are outside the case. With the Robotron Timer, a press operating cycle can be set up in 15 minutes. All that is needed is to set four dials and a switch for each bump required in the cycle. The controller is set for the exact number of bumps needed in the cycle, each bump is set for the desired time in the cycle, the amount of press opening at each bump is controlled precisely, and the time for allowing high pressure to the press is also set on a dial. With this control, a minimum number of bumps can be used, thereby reducing strain and wear throughout the press. *Taylor-Emmett Controls Inc., 445 E. Turkeyfoot Lake Rd., Akron 19, Ohio.*

Volume meter

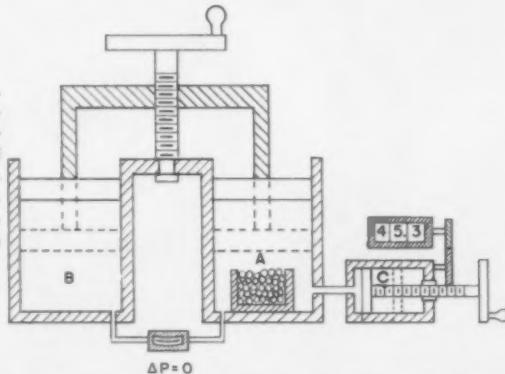
This ingeniously simple instrument, the Model 200 Air Operated Pycnometer, can be used to accurately determine the true volume of granular plastics or the volume of plastic in bottles, other molded products, or prototypes and should save many hours in determining price weights. The instrument operates in this

fashion. The volumes of two equally sized, closed chambers (A, B) of air are decreased the same amount by moving a piston into the chamber of each the same distance. Because the sample of material is placed in one chamber, the volume of air compressed in that chamber is less than in the empty chamber. Since both chambers are at the same temperature, this gives rise to a differential pressure between the two chambers which is read on an indicator. A calibrated auxiliary cylinder and piston (C) connected to the sample chamber is then adjusted to reduce the pressure in the sample chamber by increasing its volume

by an amount equal to the sample volume. The movement of the auxiliary piston is converted by the proper gear system to a digital indicator which displays the volume of the sample directly in cubic centimeters. The reading is accurate to within 0.1 cc. Initial sample capacity available 50 or 100 cc. Price \$450.00 F.O.B. mfr. Delivery 30 days, *Houston Instrument Corp., P. O. Box 22234, Houston 27, Texas.*

Hot stamping press

For decorating plastic parts using regular foil tapes, this press is designed to operate on 20 to 125 p.s.i. air and is adapted for a (To page 52)



HOUSTON INSTRUMENT Model 200 air operated pycnometer measures volume of granular or solid samples directly and presents volume in figures on dial shown at the far right.

PRODEX

HENSCHEL
MIXERS

DIFFICULT MIXING AND DISPERSION PROBLEMS ARE SOLVED WITH THE PRODEX HENSCHEL MIXER

The PRODEX-HENSCHEL MIXER, successfully used in many installations here and abroad, performs intensive dryblending and thorough dispersion of colors, pigments, fillers, stabilizers and/or plasticizers with plastics powders or granules.

It permits, if desired, the mechanical (frictional) heat-up of plastics powders faster and more uniformly than by conduction or radiation.

The unique principle of fluidizing dry powders so that they can be mixed like liquids, plus controlled shearing action, result in mixing quality and speeds heretofore not obtained.

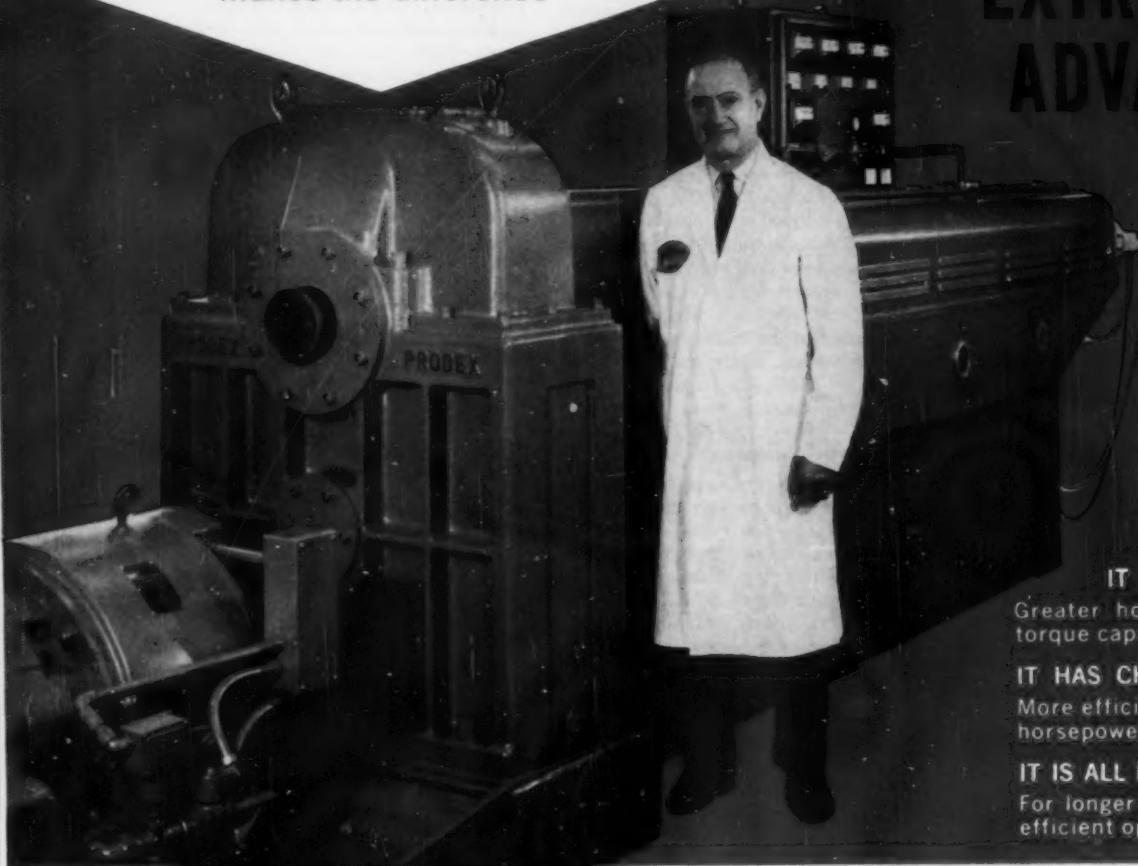
ARRANGE FOR A DEMONSTRATION
Investigate how it can increase the efficiency of your process.

Write for illustrated bulletin M-1.

PRODEX CORPORATION • FORDS, NEW JERSEY • Phone: HILLCREST 2-2800

NEW!
**HIGH TORQUE
 GEAR REDUCER**
 makes the difference

—ANOTHER PRODEX
**EXTRUDER
 ADVANCE**



LOOK AT THESE
 HORSEPOWER RATINGS *

	2½	3½	4½
MINIMUM REDUCTION	42 HP 195 rpm	92 HP 138 rpm	160 HP 116 rpm
MAXIMUM REDUCTION	20 HP 86 rpm	45 HP 60 rpm	68 HP 47 rpm

including service factor for continuous operation

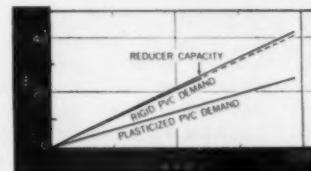
Many materials with a low viscosity can be run at high screw speeds without danger of overheating. Others, with high viscosity, must be run at lower screw speeds and require higher torque.

The new PRODEX HT EXTRUDERS permit you to run both extremes at maximum horsepower efficiency and output because of their high torque gear reducer with change gears.

See the new PRODEX HT EXTRUDERS perform with your own materials in our customer service laboratory. Write or phone for an appointment.

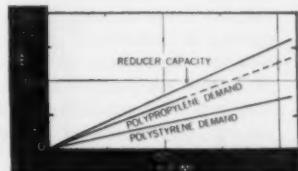
EXAMPLE 1.

The new 2½" PRODEX HT EXTRUDER with a 25 HP Dynamatic drive and gearing for 200 rpm speed, readily delivers 250 lbs/hr of plasticized PVC. For rigid PVC, change gears for 120 rpm max. screw speed are used to produce 150 lbs/hr at 80 rpm. Without the change gear provision, a 40 HP motor would have been necessary to provide adequate torque for the rigid PVC. Consequently there would be a higher initial cost, together with a severe waste of power under all conditions.



EXAMPLE 2.

The new 4½" PRODEX HT EXTRUDER, equipped with a 75 HP Dynamatic drive and gearing for 90 rpm max. screw speed, turns out 650 lbs/hr of high impact polystyrene without predrying. In order to run polypropylene M.I. 0.2, change gears for 65 rpm max. speed are used to deliver about 500 lbs/hr of this material. Without change gears, this machine would need a 125 HP drive, which would result in a substantial horsepower waste.



PRODEX CORPORATION

FORDS, NEW JERSEY • Phone: HILLCREST 2-2800

IN CANADA: Barnett J. Danson & Associates, Ltd., 1912 Avenue Road, Toronto 12

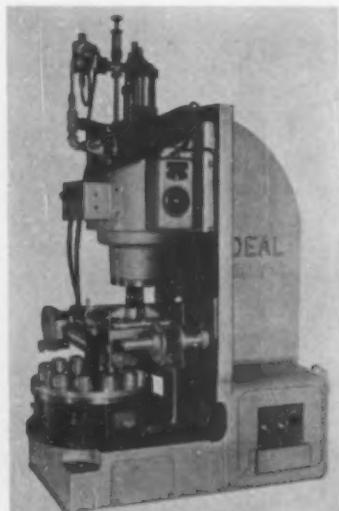
Licensor for European Common Market and Austria...HENSCHEL-WERKE GMBH KASSEL, W. GERMANY



NEW MACHINERY-EQUIPMENT

(From page 50)

2½- to 8-in. bore air cylinder having a 2- to 6-in. stroke with a maximum pressure of 4800 pounds. Hydraulic control is optional. An electronic dwell control is used with a range of 0.035- to 15-sec. dwell time. The thermostatic temperature control can be varied according to use requirements for operation at temperatures



IDEAL hot stamping press is designed to operate on 20 to 125 p.s.i. air.

between 150 and 450° F. Standard die area is 4 by 6 in., but machine can be supplied with die areas up to 6 by 12 inches. Also included in the design of the machine is a quick change die block and adjustable automatic rotary foil feed with a range of ¼ to 8 inches. Machine requires 115 v-a.c. and it can also be supplied in a 230-v. model. *Ideal Stencil Machine Co., 102 Iowa Ave., Belleville, Ill.*

Indicating temperature control instrument

The series 5000 indicating temperature controller for use on plastic processing equipment features a 10 in. slide rule readout based on a null balance servo system. Temperature control is maintained electronically without depending on the meter movement for control. The temperature indication presents a true readout of temperature of the process being controlled throughout the entire range of the instrument without limiting stops. The instrument is available with either time propor-

tioning or on-off control, with or without anticipating section. Control stability of the proportional model with anticipating section has been achieved to ± 0.1 ° F., and to ± 0.5 ° F. with the On-Off model with anticipation. Indication accuracy is $\pm \frac{1}{2}\%$ of scale range. High and low alarm contacts can be provided as an optional feature. The 5000 series control is provided with plug-in plastic encapsulated circuitry. This provides freedom from dust and moisture, insures continued operation under shock and vibration, which permits mounting of the controllers directly on machinery. *Electronic Processes Corp. of Calif., 436 Bryant St., San Francisco 7, Calif.*

Compression press

Originally designed to produce 36 in. high ceramic parts, this unusual 50-ton hydraulic press has an exceptionally long stroke of 78 in. and can be used for the production of long draw plastic parts. Standing 19 ft. high, it has 24 in. between 6-in.-diameter twin columns and 108 in. of daylight. Manually operated, it is powered by a 3-hp. motor with a 7-to-1 booster and has a 50-gal. hydraulic fluid reservoir. Basic machine sells for under \$10,000. *The Crossley Machine Co. Inc., Monmouth and Bell Sts., Trenton, N. J.*

Preheater

The Model C6C-P preheater is designed for heating small preforms or loose powder prior to compression or transfer molding. The equipment operates at a frequency of 60 MC. and will heat up to 1 lb. of material on normal cycles. Because of the high frequency, materials with mica filler, melamine, and diallyl phthalate resins can now be handled. Output is 0.75 to 1 kw. with an input of 1.8 kw.-amp. at 120 v., 60-cycle a.c. Platen size is 6 by 6 in. square. The equipment is forced air-cooled, has adjustable platen, timer, and safety switches. Priced under \$1000. *Reeve Electronics Inc., 609 W. Lake St., Chicago 6, Ill.*

Miniature heater

A series of miniature cartridge heaters, $\frac{1}{8}$ in. in diameter in any desired length, are designed for applications where space is limited and heat requirements are high. The $\frac{1}{8}$ in. units operate at maximum surface temperatures up to 1250° F. Most voltages, including 115 and 230, may be ordered at no extra charge.

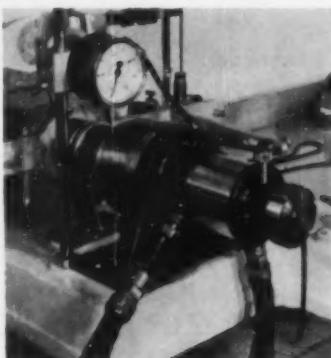
Construction details of the $\frac{1}{8}$ in. unit include series 304 stainless steel sheaths; diameter tolerances of ± 0.000 in. -0.002 in.; length tolerance $\pm \frac{1}{16}$ in.; heating elements supported on ceramic, packed with magnesium oxide and Teflon-insulated; stranded nickel alloy lead wires. Units may be ordered to any wattage density up to and including the maximum of 50 w./sq. inch. *Hotwatt Inc., 75 Maple St., Danvers, Mass.*

Metallizing wire

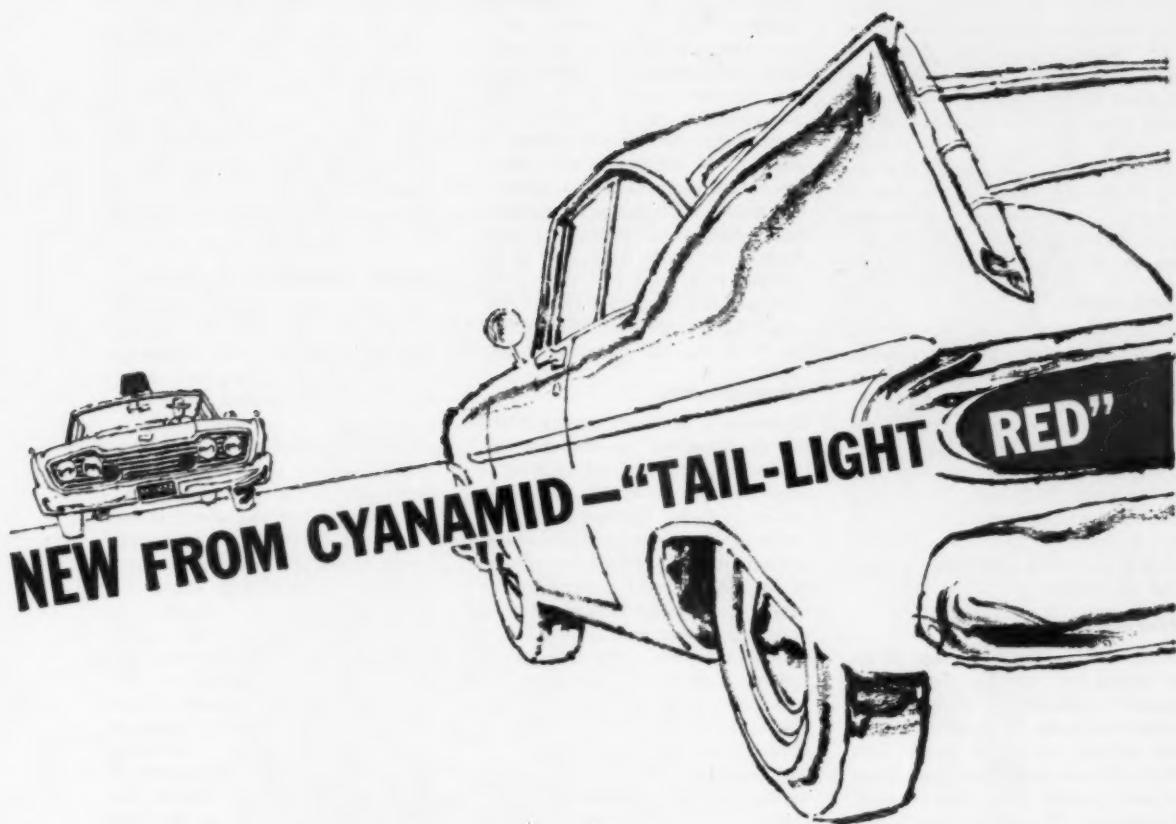
Three new tungsten strand coils for vacuum metallizing, two of them with aluminum cores, are now available for immediate shipment. The sizes of the aluminum core coils are 3 by 0.025 in. and 3 by 0.030 inch. The other new coil is 4 by 0.030 inch. New high performance tungsten wire provides superior shot life in vacuum metallizing. Controlled recrystallization of the tungsten produces a uniform flash-over in the vacuum metallizing process. A crystallization rate that is too fast or too slow will cause sagging or brittleness in the wire which can result in premature breakage during reloading as well as in processing. *Sylvania Electric Products Inc., 730 Third Ave., New York 17, N.Y.*

Extruder head

A new extruder attachment for the Plastograph comes with two screws and can be used to measure the work and/or power required to extrude rubber or elastomers with similar properties. The jacket of the new screw attachment can be maintained anywhere up to 200° C. The Plastograph is used for color matching; anti-oxidant and anti-



C. W. BRABENDER extruder attachment designed for the Plastograph, showing its use with the basic instrument to measure the degree of power consumption in extrusion operation.



CALCO[®] OIL RED ZMQ gives "GO" sign to today's up-to-the-minute thermoplastics!

Here at last—the highly purified Cyanamid version of an old favorite, Anthraquinone Red, "tailor-made" for the thermoplastic market—Calco Oil Red ZMQ. It is unexcelled for tail lights and other signalling equipment, indoors or out...wherever a clear, bright, absolutely *lightfast* red is of vital importance. Check these advantages: • PURITY—triple recrystallization • CLEANLINESS—less than 50 ppm of heavy metals • SOFTNESS—cuts process time • BRIGHTNESS—higher than current standards • DISPERSION—excellent • For samples, technical counsel—call Cyanamid, dye specialists for the plastics industry since 1937.

NOTE: THE COLOR OF THIS AD APPROXIMATES THE SHADE OF CALCO OIL RED ZMQ.



AMERICAN CYANAMID COMPANY • DYES DEPARTMENT • BOUND BROOK, N.J.

NEW MACHINERY-EQUIPMENT

(From page 52)

static studies; also, polymer stability analysis, determination of graft sites and molecular weights. Available with special mixing blades which are suitable for all the newest materials and their elevated temperatures, it shows flow index values under production conditions. Rheological studies of flow performance can also be made. *C. W. Brabender Instruments Inc., 50 East Wesley St., South Hackensack, N. J.*

Gate cutter

Measuring only $6\frac{1}{2}$ in. in over-all length, gate cutter has sharply ground knife edges with flat backs for close cutting of plastics only. The cutters are of IMS design and West German manufacture. They have blades almost 1 in. long and leaf spring action, \$3.75 each. This brings IMS's line of gate cutters to five different models. *Injection Molders Supply Co., 3514 Lee Road, Cleveland 20, Ohio.*

Process heater

Designated as Type PF, this series of automatic electric fluid heat transfer systems is designed for simple hook-up to revolving rolls and platens, dies and molds, and other process equipment. All types of heat transfer fluids can be used. It includes a Chromalox electric immersion heater, motor and high-temperature pump, by-pass relief valve, strainer, expansion tank, temperature controls, contractors, and disconnect switches. All of this equipment, mounted on a steel base with protective grille enclosure, takes only 6 square feet for smaller models, 12 square feet for larger models. Temperatures may be selected and accurately controlled anywhere from 100 up to 600° F. Built-in controls eliminate explosion or fire hazard. Ten models are available in both standard and special voltages and phases. Wattage ratings range from 4.5 to 80 kw., with B.t.u. output from 15,350 to 272,000. *Radcor Inc., 7500 Thomas Boulevard, Pittsburgh 8, Pa.*

Moisture analyzer

Plastic processors using hygroscopic materials such as nylon or cellulose, should find the Model HFS-4E moisture meter most useful. This instrument detects the presence of up to 70% moisture to an accuracy of 0.1% or better by measuring the dielectric loss caused by this moisture. Moisture measurements are made in

a matter of seconds by filling a cup electrode with the material to be measured, placing it on the instrument, and reading the moisture content directly in percents. Continuous measurements can be made by incorporating the proper design of electrode in the production equipment. The instrument does have to be calibrated for the particular material with which it is to be used. Normal variations in density of the material or granule size have no effect on the measurement. Price: about \$1,900. *Boonton Polytechnic Co., P. O. Box 125, Boonton, N. J.*

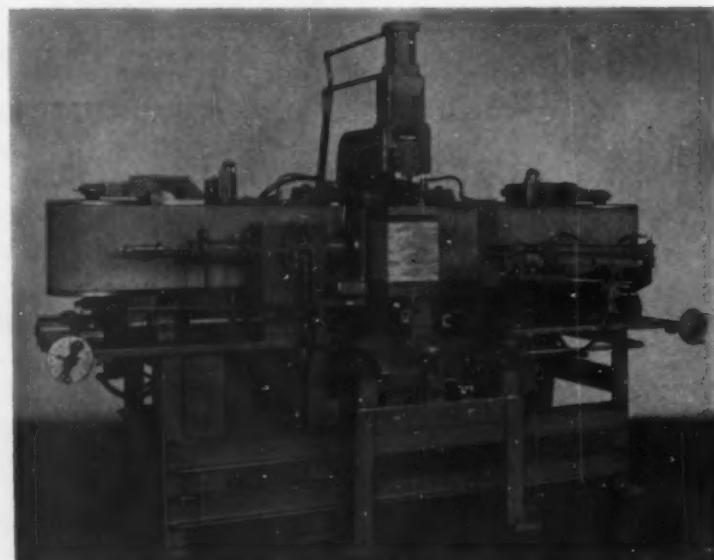
Edge grinder

Known as a "precision edge grinder," this machine can be used for high production squaring and finishing of vinyl floor tile, laminates, and similar plastic products. Corners of finished products are sharp and edges are ground parallel and square. Blocks of material, or work piece, pass between the two oscillating, abrasive belts, index, and then return. Finish depends upon the abrasive belt used, and machines are available for use with any desired belt width. Machine may be set up to allow the blocks of material to make several passes before indexing. The production rate depends on the material and finish desired. A typical rate measured on terra-vinyl and vinyl asbestos floor tile was two to three 10-in. stacks per minute. Tolerances maintained were

within 0.001 in. on squareness, and parallelism of the 10-in. stack was within 0.0015 inch. For higher production rates, machines may be arranged in tandem, with indexing to suit the operation. Loading may be manual or automatic. Traverse of the work is hydraulically controlled and can be operated by hand or automatically cycled. Carrier and heads are mounted on hardened and ground, boot-protected shafts. Machines can be supplied that are modified to the customer's specific requirements. *Murray-Way Corp., P. O. Box 180, Birmingham, Mich.*

Static electricity detector

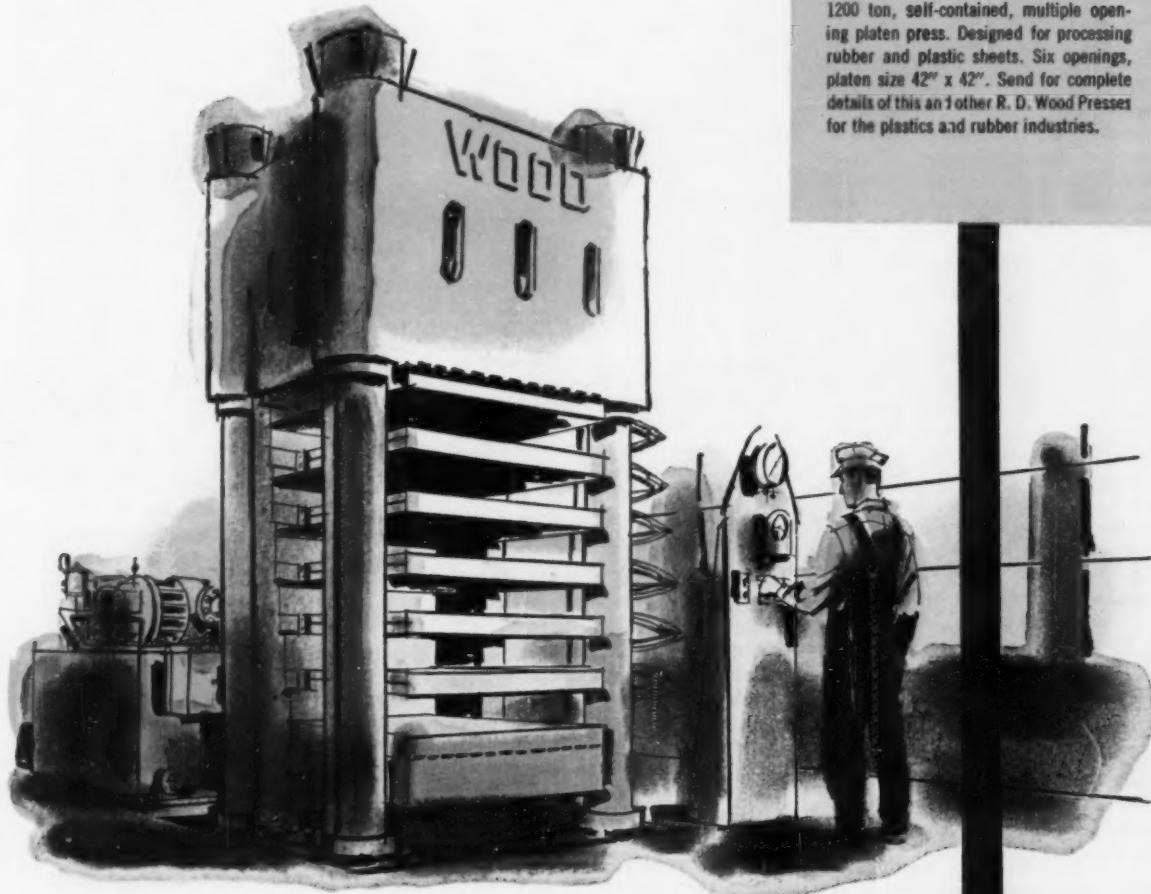
The electrostatic locator—Type E—detects electrostatic charges by electrostatic induction. The presence of such charges in industrial processes can constitute a serious fire and explosion hazard and frequently introduces production difficulties by causing erratic behavior of certain materials during processing. Pointing the probe of the meter toward a charged object, will cause a meter needle to deflect. The linear scale of the meter is graduated $-10, 5, 0, 5, 10+$, indicating the polarity and relative magnitude of the charge. Three sensitivity ranges of the meter are provided by adjustment of apertures built into the probe. Where more precise quantitative measurements are required, calibration charts are used to determine the actual voltage on the charged material. Voltages as low as 50 v. and as high as 40,000 v. can be measured. Power is supplied by one standard flashlight cell and (To page 178)



MURRAY-WAY precision edge grinder shows the machine square-grinding a stack of vinyl asbestos floor tile.

***There's always a job for a Wood Press...
and a Wood Press to do the job***

When you want a production shortcut—or downtime and costs need cutting—there's a job for a Wood Press. And in almost every type of plastics or rubber operation, there's a Wood Press to do the job. R. D. Wood builds presses for such jobs as molding, curing, laminating, polishing and processing—besides designing and constructing others for special work. All have three things in common: sound design, carefully selected materials, conscientious workmanship. As a result, R. D. Wood Presses consistently deliver the utmost in smooth, dependable performance; fast, economical production; trouble-free operation. Write for catalog and engineering information—without obligation.



1200 ton, self-contained, multiple opening platen press. Designed for processing rubber and plastic sheets. Six openings, platen size 42" x 42". Send for complete details of this and other R. D. Wood Presses for the plastics and rubber industries.

R. D. WOOD COMPANY
PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA



WORLD-WIDE PLASTICS DIGEST*

Abstracts from the world's literature relative to plastics. For complete articles, send requests direct to publishers. List of addresses is at end of this section.

General

Crystals guide film quality. Chem. Eng. News 38, 38-39 (Feb. 1, 1960). A new process for producing polymorphous polyethylene film gives greater clarity, higher impact resistance, and greater resistance to tear than present films.

Unsaturated polyesters. J. E. Sayre and P. A. Elias. Chem. Eng. News 37, 56-62 (Dec. 21, 1959). Production figures, makers, uses by categories, and applications of polyester plastics are discussed.

New question in plastics. Chem. Week 86, 23-24 (Mar. 5, 1960). Potential production and uses of poly-formaldehyde plastics is dependent on the rate of decrease in price. Several domestic and foreign manufacturers are considering this new plastic material.

Classification of high polymer materials. O. Leuchs. Kunststoffe 50, 10-13 (Jan. 1960). In Germany, Austria, Holland, and Switzerland the word "kunststoff" is used to designate synthetic resins; in other countries the term "plastics" derived from the word "plastic" (i.e., pliable, flexible) is used. Objection can be raised against both these terms when they are applied to all high polymer materials. The suitability of the two terms and the further development that may occur in the classification of these materials are considered as well as discussed.

New heat on high-temperature polymers. Chem. Week 86, 57-58, 60 (Mar. 12, 1960). The goals of government contracts with chemical manufacturers to develop new polymers that are heat-resistant up to 1000° F. are reviewed. The chemical compounds that are being considered are discussed.

New epoxy entry. Chem. Week 86, 32-33 (Feb. 13, 1960). Epoxidized polyolefin resins are easy to cure and have low density and good high temperature properties.

New plastic coat shrugs off heat. Chem. Eng. News 38, 54, 56 (Mar. 28, 1960). A plastic coating effective at temperatures up to 6000° F. is composed of inorganic phosphates

*Reg. U. S. Pat. Off.

and borates in a polyurethane. On heating it foams and melts forming a hard ceramic-like crust.

Fluorocarbon studies lead to high temperature polymers. Space/Aeronautics 32, 109, 111, 113 (Dec. 1959). Research at the National Bureau of Standards on aromatic fluorocarbons that are expected to yield radiation and high-temperature resistant plastics is summarized.

Materials

Vinyl hydrosols. W. A. Riese. Kunststoffe 50, 83-84 (Jan. 1960). Vinyl hydrosols are defined as redispersed systems of polyvinyl chloride, plasticizers, fillers, and pigments, as well as processing aids, in water systems which, possibly with the help of added thickening agents, are homogeneous dispersions with Newtonian viscosity behavior. With a solids content of 55 to 65%, hydrosols resemble plastics in their processing characteristics and application, but differ from the latter in that they are able to take up more filler than plastics. Typical formulations are given.

Multiaxially stretched low-pressure polyolefin film. K. Richard, G. Die-drich, and E. Gaube. Kunststoffe 49, 671-78 (Dec. 1959). The characteristics and behavior of low-pressure PE and polypropylene films multiaxially stretched are reported.

Low-pressure reinforced plastics. M. W. Riley. Materials in Design Eng. 51, 103-18 (Feb. 1960). Materials, molding methods, and design data are considered. The four basic families of resins used for low-pressure reinforced plastics are the polyesters, epoxies, phenolics, and silicones. In addition to fibrous glass and many of the synthetic fibers, graphite textiles and metal fibers have found some uses. The low-pressure molding processes commonly used include contact molding, bag molding, autoclave, matched die, filament winding, and spray molding. Glass content, laminate thickness, and orientation of the glass filaments are all important variables that influence the properties of the completed structure. Reinforced plastics are sensitive to duration of loading. Tensile creep at room temperature appears to be negligible, both parallel and perpendicular to

the warp. Strength, stiffness, fatigue, and impact properties of glass-reinforced plastics tend to increase with decreasing temperature. In general, the dielectric constant and loss tangent decreases with increasing frequency above the very high frequency range.

Use of reground glass-filled polystyrene. G. R. Rugg. SPE J. 15, 1053-54 (Dec. 1959). A test program was established to study the feasibility of using reground glass-filled polystyrene in meeting certain military specifications normally requiring 100% virgin material. The results indicate that up to 30% coarsely ground material can be added with the product still capable of passing the drop impact test. Laboratory results for tensile strength and Rockwell M hardness correlate with end item suitability.

Molding and fabricating

Continuous forming of thermoplastic sheet by a rotational deep drawing method. G. Missbach. Kunststoffe 50, 140-42 (Feb. 1960). A continuous process for vacuum forming parts from sheet plastics is described. The process is a revolving drum type.

Fully automatic insertion of metal parts. K. Wopalka. Kunststoffe 50, 142-45 (Feb. 1960). The design and construction of a twin-impression injection mold used to insert brass wire into a plastic molding speeds up considerably the incorporation of metal inserts.

Fluidized bed: Heavy coatings in one dip. W. R. Pascoe. Materials in Design Eng. 51, 91-95 (Feb. 1960). The parts to be coated are preheated to a temperature above the melting point of the plastics coating material. The preheated parts are immersed in a fluidized bed of finely-divided plastic powder. The powders are fluidized by an ascending current of gas or air. The part may be post-heated to completely coalesce the coating. Coatings from 5 to 50 mils thick can be produced in a single dip. Coatings obtained with this process are uniform and of high quality. The process is well suited for applying solvent-resistant materials such as nylon. The mechanical, electrical, (To page 58)



FEDERAL PACIFIC PRAISES EXCELLENT ELECTRICAL PROPERTIES OF **RCI PLYOPHEN 5660**



More than 50,000 circuit breakers, as well as a wide array of other electrical devices, are produced every day by Federal Pacific Electric Company's Distributor Products Division plants in Newark, New Jersey. "Each of these circuit breakers has an average of three parts molded from phenolic resin compounds," states R. B. Goody, in charge of plastics research. "This makes it imperative that the resin used meet strict performance criteria. RCI PLYOPHEN 5660 exceeds these requirements in our production."

Here are some of the resin characteristics that FPE seeks and PLYOPHEN 5660 provides:

- Electrical properties that resist voltage breakdown

in accordance with the rigid safety codes of the Underwriters' Laboratories.

- Ability to withstand severe physical shocks.
- Minimum warpage and moisture absorption under extreme temperature and humidity conditions.
- Good mechanical stability.

"RCI PLYOPHEN 5660 (phenol-formaldehyde resin) passes all these tests. Molded part rejections due to material failure are less than one-tenth of one percent," says Mr. Goody.

If your production calls for phenolics, remember that RCI offers over 40 individual types of PLYOPHEN, both liquids and powders, for bonding, laminating, impregnating or casting applications. Moreover, every RCI customer gets the benefit of expert technical assistance whenever required. Write today for complete information (state specific application).

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride • Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenate • Sulfuric Acid • Methanol

Creative Chemistry . . . Your Partner in Progress

REICHOLD 
REICHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N.Y.

(From p. 56)

and thermal properties, chemical resistance, and applications of six types of coatings are given. These include cellulosic, vinyl chloride, epoxy, nylon, polyethylene, and chlorinated polyether coatings.

Applications

Evaluating polyethylene films for agriculture. V. L. Gliniecki. Down to Earth 15, 7-9 (Winter 1959). The properties of polyethylene films that are needed to evaluate their usefulness in agricultural applications are reported. These include weatherability, soil temperature buildup, moisture retention, weed control, and gas transmission. The black films give the best weatherability. Increasing the thickness also increases weatherability. Soil temperatures are higher, moisture retention is improved and gas retention for fumigants is excellent when the film is used as a general cover. Black film is needed for weed control.

Laying plastics floor coverings. E. Fortun. Kunststoffe 50, 137-40 (Feb. 1960). Principal requirements that are necessary for laying plastic flooring are summarized.

Plastics in building. Plastics Inst. Trans. and J. 28, 4-48 (Feb. 1960). Seven symposia papers. "Nature, properties, and uses of plastics," by C. W. Welch, pp. 4-12. The structure, properties, methods of processing, prices, and design criteria of plastics are reviewed briefly from the viewpoint of their use in building. The properties are compared with those of other construction materials. "Operations," by S. Greenwood, pp. 12-18. Problems concerned with forming plastic building parts are discussed. "Construction," by D. S. Mahon, pp. 19-26. The uses of plastics as primary structural components, as secondary structural components, and in decoration and fittings are considered. "Plastics as components in dome and roof structures," by Z. S. Makowski, pp. 26-29. Dome and roof structures made of fiber-glass-reinforced polyester plastics and of conventional materials covered with vinyl chloride plastics and neoprene, are described. "Services," by W. L. Thorne, pp. 30-36. Plastics used in sound insulation, water pipes, drainage systems, heating and lighting systems, guttering, soffit and fascia boards, and gas mains are described. Data are also given on installation and mainte-

nance costs. "Thermal insulation," by W. B. Brown, pp. 36-44. The uses of cellular plastics in building construction for thermal insulation are described. The properties of these materials are given and compared with other insulating materials. "Performance and aesthetics," by G. K. Frindlay, pp. 45-48. The uses of plastics in bathtubs, wall tiles, window frames, and suspended ceilings are described.

Unveiling the newest plastic package. Chem. Week 85, 195-96, 198 (Nov. 21, 1959). A process for making boxes from biaxially oriented polystyrene sheet by a cold-forming operation is described.

Properties

Characterization of polyolefins by differential thermal analysis. B. Ke. J. Polymer Sci. 42, 15-23 (Jan. 1960). Differential thermal analysis was used to study the solid-liquid transitions of four polyethylenes, an isotactic polypropylene, a series of ethylene-propylene copolymers, and a physical mixture of polyethylene and polypropylene. The thermograms obtained directly yield the transition temperatures. By calibration, heats and entropies of fusion were also derived from the thermograms. From the heats of fusion, the degree of crystallinity of these polymers was calculated. Differential thermal analysis can detect a physical mixture of polymers that melt sufficiently wide apart. The thermogram-peak areas are proportional to the amounts of material present. Convenience and speed make differential thermal analysis a useful and practical tool for characterizing polymeric materials when uniform conditions are maintained.

Influence of fillers on the structure and electrical properties of plasticized PVC compounds. M. Kreiss. Kunststoffe 49, 679-83 (Dec. 1959). Electrical measurements show that fillers added to plasticized PVC tend to absorb plasticizer. Fillers also absorb saponification products and thus improve electrical values. Results of measurements of $\tan \delta$, the loss angle, as well as stability, electrical, and water storage experiments indicates that the filler particles, which differ in size, are embedded randomly in the tangled PVC molecules. The size of the individual filler particles, whose surfaces are split, is roughly the same as that of a PVC

thread molecule. The forces of attraction between the filler particles and their surroundings are very small. The remaining spaces, about 10^{-7} cm., have no connection if the filler content is low and filler distribution is even.

Dielectric properties of linear polyamides. D. W. McCall and E. W. Anderson. J. Chem. Phys. 32, 237-41 (Jan. 1960). The dielectric relaxation of several linear polyamides was measured to study the nature of the molecular motion of the polymers. The materials are of special interest because of the great strength of their interchain forces. The amorphous portions of these polymers are primarily responsible for their dielectric properties. Amide protons carry direct current and are responsible for the low-frequency loss. Dipole relaxation is the important loss mechanism at high frequencies and elevated temperatures. Relaxation occurs in dielectric loss and proton resonance studies, indicating movement of both the dipolar and paraffinic components of the molecule, even at low temperatures.

Structure and properties of metals, glass, and plastics. K. H. Hellwege. Kunststoffe 50, 3-10 (Jan. 1960). A comparison of metals and plastics shows, from the point of view of the physicist that they are similar. It seems that plastics will in future prove to be crystals with the highest degree of disorder or liquids with the highest degree of order. Analysis of structural elements as well as elementary processes is one of the most important tasks that is facing plastics research.

Testing

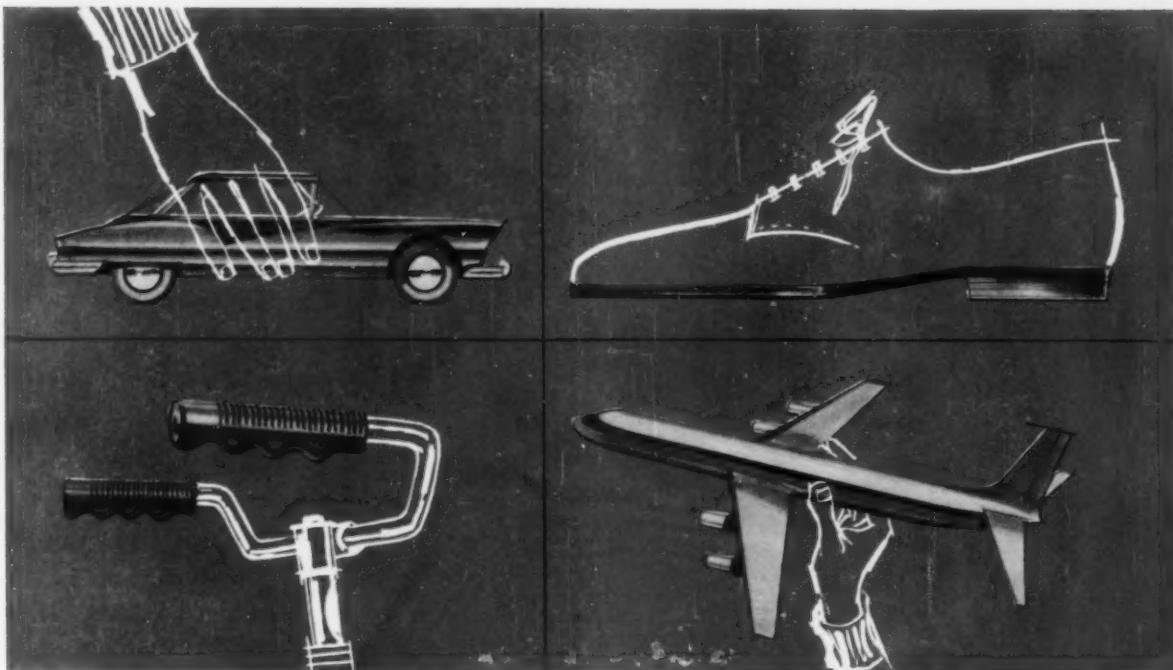
Physical methods of testing plastics. A. J. Staverman and J. Heijboer. Kunststoffe 50, 23-26 (Jan. 1960). Present methods of test are unable to measure all the important mechanical properties of plastics. Scientific research will lead to new ways of testing plastics.

Hardness, abrasion, and wear resistance testing of plastics. L. Boor. ASTM Bulletin 244, 43-47 (Feb. 1960). Methods for measuring hardness, abrasion, and wear resistance of plastics are reviewed, compared, and evaluated. 18 references.

Improved NBS abrasive jet method for measuring abrasion resistance of coatings. A. G. Roberts. ASTM Bulletin No. 244, 48-51 (Feb. 1960). A description is given of improvements made in the NBS Abrasive Jet Method since pub- (To page 184)

MAKE A MILLION INJECTION MOLDINGS THE EASIER WAY

with Borden polyvinyl chloride resins!



Production is smoother, profit more certain when you use Borden resins. Borden's VC-65 and VC-80 PVC resins . . . ideal for dry-blended injection molding operations . . . offer:

1. Low molecular weight.
2. Exceptionally fast plasticizer absorption at very high plasticizer concentration.
3. Excellent dry-blending.
4. Good heat and light stability.

To make your million the easy way . . . and make profits more certain, start with Borden polyvinyl chloride resins. See your Borden representative today or write "PVC," The Borden Chemical Company, 350 Madison Avenue, New York 17, N.Y.

Borden's Polyvinyl Chloride Resins

	Relative Viscosity ± .03
VC-65	1.55
VC-80	1.75
VC-90	1.90
VC-95	2.02
VC-98	2.12
VC-100	2.25
VC-105	2.41
VC-105PM	2.41

IF IT'S A **Borden**  **Chemical** IT'S GOT TO BE GOOD!

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

U. S. Pats., Feb. 16, 1960

Printing on plastic. W. E. Hastings (to National Dairy). 2,924,923.

Heat sealing. W. Jaquier (to Chipewa Plastics). 2,925,119.

Tank of reinforced resin. J. F. Gibb (to National Tank). 2,925,193.

Tappable container. J. W. Brookshier (to B-Line Dispensers). 2,925,199.

Polyolefin composition. A. Y. Coran and H. L. Merten (to Monsanto). 2,925,398.

Elastomeric copolymer. P. Schneider, G. Scriba and W. Graulick (to Bayer). 2,925,399.

Polyolefins. C. E. Tholstrup, A. Bell, G. C. Newland, J. W. Tamblyn, and C. J. Kibler (to Eastman Kodak). 2,925,400-1.

Polyepoxides. E. C. Shokal (to Shell). 2,925,403.

Copolymers of a dicarboxylic acid. J. R. Caldwell and J. W. Wellman (to Eastman Kodak). 2,925,404.

Polyesters. T. M. Laakso and J. L. R. Williams (to Eastman Kodak). 2,925,405.

Polythioalkylacrylates. R. M. McCurdy and J. H. Prager (to Minnesota Mining). 2,925,406.

U. S. Pats., Feb. 23, 1960

Surface hardening. J. Mahler (to American Optical). 2,925,622.

Plastic window pane. K. Sundby. 2,925,862.

Edge-heating thermoplastic dielectrics. W. Rueggeberg (to Armstrong Cork). 2,925,864.

Shrinkproofing oriented polyethylene. M. J. Coplan, R. J. Coskren, and T. T. Constantine (to Fabric Research). 2,926,065.

Paper-containing polyamide suspensoid. H. W. Hooff (to General Mills). 2,926,117.

Graft copolymers. R. K. Graham and M. S. Gluckman (to Rohm & Haas). 2,926,126.

Phosphono-polyesters. R. L. McConnell and H. W. Coover Jr. (to Eastman Kodak). 2,926,145.

Polyisocyanate composition. G. Rap-

pert, J. A. Szaruga, and J. R. Wall (to General Motors). 2,926,147.

Cumylphenol - phenol-formaldehyde resin. F. Backer (to Allied Chemical). 2,926,149.

Thermal stabilization of haloethylene polymers. D. A. Gordon (to Dow). 2,926,152.

Polyamide-epichlorohydrin resins. G. I. Keim (to Hercules). 2,926,154.

Chlorinated polyolefins. J. S. Tinsley (to Hercules). 2,926,159.

Diallyl amine polymers. G. B. Butler, R. J. Angelo, and A. Cranshaw (to Peninsular). 2,926,161.

U. S. Pats., Mar. 1, 1960

Foam structures. W. D. Garlington (to Du Pont). 2,926,389.

Release coating. C. W. Wilkins (to Owens-Illinois). 2,926,829.

Photopolymerizable compositions. E. L. Martin and A. L. Barney (to Du Pont). 2,927,022-3.

Atactic polypropylene. F. Schulde, W. Sommer, and D. Schleede (to Lucius & Bruning). 2,927,047.

Triazine-formaldehyde resins. A. Hiestand and O. Albrecht (to Ciba). 2,927,090.

Polystyrene phonograph record. E. A. Naudain and A. L. Rummelsberg (to Hercules). 2,927,092.

Polyvinyl chloride composition. W. M. Germon (to Goodyear). 2,927,093.

Epoxy resins. C. E. Wheelock (to Phillips). 2,927,094.

Phenolic resins. R. L. Von Berg and N. L. Poffenberger (to Dow). 2,927,097.

Block copolymers of *N*-vinyl pyrrolidone. J. W. Breitenback and H. Edelhauser (to W. R. Grace). 2,927,102.

Polyisobutylene. A. B. Small and J. L. Ernst (to Esso). 2,927,104.

Polyethylene. H. Nienburg, G. Schiller, H. Weber, and H. Boehm (to Badische Anilin). 2,927,105.

Polyethylene. H. J. Hepp and E. O. Box Jr. (to Phillips). 2,927,106.

U. S. Pats., Mar. 8, 1960

Packaging fluid in plastic bags. L. Doyen and L. Doyen. 2,927,410.

Plastic drive fastener. G. M. Rapata (to Illinois Tool). 2,927,497.

Laminating machine. A. F. Elliott. 2,927,620.

Cellular core. P. Hoppe and H. W. Paffrath (to Bayer and Mobay). 2,927,876.

Fluorochloro polymer. D. E. Neunherz (to Minnesota Mining). 2,927,-893-4-5.

Expanded polyurethane. C. F. Eckert (to U. S. Rubber). 2,927,905.

Fluorinated organopolysiloxanes. G. M. Konkle and T. D. Talcoff (to Dow Corning). 2,927,908.

Masonry water-repellent coating. J. D. Lyons and B. C. Carlson (to Dow Corning). 2,927,909.

Phenolic-organosiloxane cements. R. H. Cooper (to Dow). 2,927,910.

N-vinyl lactam polymers. F. Grosser (to General Aniline). 2,927,913.

Vinyl ether polymers cross-linked with iodine. W. A. Hosmer and A. C. Starke (to General Aniline). 2,927,-914.

U. S. Pats., Mar. 15, 1960

Curing of polyepoxides. W. J. Belanger and H. G. Cooke Jr. (to Devoe & Raynolds). 2,928,794.

Molding composition. J. S. Tinsley (to Hercules). 2,928,795.

Polymer composition. J. Rehner Jr., H. K. Wiese, and A. M. Gessler (to Esso). 2,928,802.

Curing polyepoxides. W. J. Belanger and H. G. Cooke Jr. (to Devoe & Raynolds). 2,928,803.

Curing polymerizable esters. G. L. Foster and P. F. Nicks (to Imperial Chemical). 2,928,804.

Silicone - acrylonitrile copolymers. D. L. Bailey and R. M. Pike (to Union Carbide). 2,928,806.—End



BREEDING BETTER VINYL'S EVERY DAY

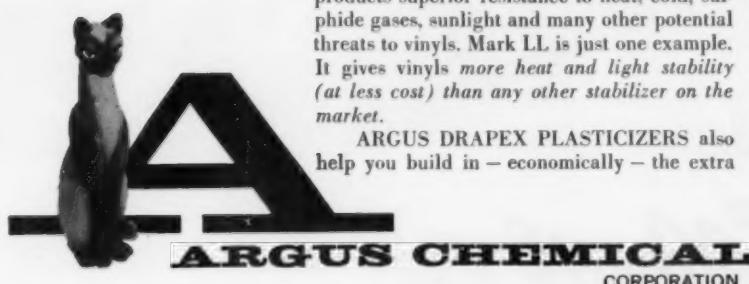
There's thoroughbred performance for vinyls in those big, bright drums!

ARGUS MARK STABILIZERS give your products superior resistance to heat, cold, sulphide gases, sunlight and many other potential threats to vinyls. Mark LL is just one example. It gives vinyls *more heat and light stability (at less cost) than any other stabilizer on the market.*

ARGUS DRAPEX PLASTICIZERS also help you build in — economically — the extra

measure of quality that characterizes first-rate vinyls. Drapex 4.4, for instance, gives your vinyls the performance of the finest epoxy plasticizer—and it costs you *less than ordinary plasticizers. Its lower specific gravity reduces volume costs by six per cent!*

If you'd like your vinyls to process better, sell faster, wear longer—check with Argus. If our research chemists don't have the answers, they'll get them! Call or write for consultation, technical bulletins, samples.



New York and Cleveland

Main Office: 633 Court Street, Brooklyn 31, N.Y.

Branch: Frederick Building, Cleveland 15, Ohio

Reps.: H. M. Royal, Inc., 11911 Woodruff Ave., Downey, California; Philipp Bros. Chemicals, Inc., 10 High St., Boston; H. L. Blachford, Ltd., 977 Aqueduct St., Montreal, Quebec. European Affiliates: SA Argus Chemical NV; 33, Rue d'Andervlecht, Drogenbos, Belgium—Lankro Chemicals, Ltd.; Selters Lane, Eccles, Manchester, England.

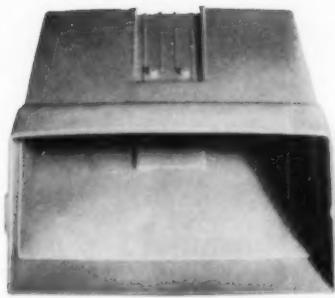


THE NEW HOME OF
BISSELL

IS THE HOME



Fellows 
injection molding equipment



OF SIX FELLOWS NO. 12-350 MACHINES



Here's a plant where the functional beauty of the exterior is matched by the efficiency of the production equipment inside.

In the manufacture of its high-quality line of home-cleaning equipment, Bissell, Inc., Grand Rapids, Michigan relies on six Fellows No. 12-350 injection molding machines to produce difficult-to-mold parts at high production rates.

The fully-automatic Fellows No. 12-350 machine, with all controls grouped for easy reading, dry cycles at 600-800 per hour.

Its standard Pre-Pac device double-strokes the plunger during press dwell, permitting shots up to 20 ounces (33 cubic inches).

The Fellows No. 12-350 machine is easy to set up, and requires so little supervision that one operator can often handle three or more machines at the same time.

Find out how Fellows can help you to handle even your toughest molding jobs. Get in touch with your Fellows representative.

THE FELLOWS GEAR SHAPER COMPANY *Plastics Machine Division*, Head Office and Export Department, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich. • 150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39 • 6214 West Manchester Ave., Los Angeles 45

from front office to fairway...
a chip shot away!



Scene: *BERKSHIRE COUNTY, Western Massachusetts*

PLASTICS MANUFACTURERS

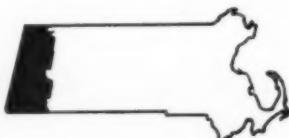
A recent survey by A.D. Little Company, leading industrial research organization, shows Berkshire County ideally suited for this type of business. Every month more manufacturers locate in Berkshire County where the phrase "unparalleled livability" means industrial livability as well!

Getting in nine holes on a long lunch and getting back to business is a breeze in Berkshire County. A famous year-round sportsmen's paradise, Berkshire County offers, in addition to its unsurpassed livability, these vital factors: a skilled, stable labor force, cooperative local government, excellent transportation, power, natural gas and utilities, fine schools and cultural activities. In short, the best site for your business, the best setting for your home is Berkshire County.

LOCATION: Strategically located at the western end of the Massachusetts Turnpike, Berkshire County is immediately adjacent to the connecting New York Thruway. 900 miles of continuous turnpikes, from Boston to Illinois, link Berkshire County to major markets of the East and Mid-West.

For complete details on available sites, write:

BERKSHIRE COUNTY INDUSTRIAL DEVELOPMENT COMMISSION
COURT HOUSE, PITTSFIELD, MASSACHUSETTS



U.S.I. POLYETHYLENE NEWS

A series of advertisements for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

JUNE, 1960

A. E. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation

30 Park Ave., N.Y. 6, N.Y.

Packaging Notes

Molded polyethylene containers which can be hermetically sealed by automatic packaging machines are now available for frozen or chilled foods. The semi-rigid containers are reported to be useful for many applications where plastic has heretofore been inadequate due to problems of leakage or dehydration. After the containers are filled, polyethylene film is heat sealed around the reclosable lids, thus hermetically enclosing the contents of the package. A convenient pull tab is provided for initial opening.

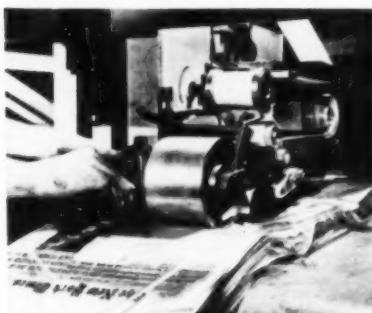
The containers are currently produced in pint and half-pint sizes. They are supplied in from one to four colors or can be left with a clear background for product visibility.

The manufacturer claims the polyethylene containers offer shipping and handling economies because they are lightweight and unbreakable.

Safety snap-on caps which fit tightly over medicine bottles, are a recent polyethylene development. They make it virtually impossible for children to get at the bottle's contents, yet adults can easily remove the caps with a flick of the thumb. The closures are said to stay secure no matter how often they're used.

Newspapers in heat-sealed polyethylene bags are now being mailed to subscribers for the first time, reports a metropolitan publisher.

Copies of the paper's Sunday edition are bagged at the rate of 1,500 per hour, using semi-automatic baggers and a continuous heat sealer. A special machine handles rolls of pre-addressed labels, coated on the reverse side with a thermoplastic adhesive.



Roll stock, pre-printed with subscriber's name and address, is automatically heated, cut, indexed and placed on the bags by the labeling attachment. The thermo-plastic coating of the label adheres firmly to the polyethylene bag.

The pre-formed 14 x 19½" polyethylene bags permit copies to be shipped flat, facilitating handling, stacking and shipping.

Newspaper officials report that the 1.5 mil polyethylene bags protect papers against rough handling, soiling, tearing and weather. They agree that the improved appearance of the paper should have an influence on customer re-orders of mail subscriptions.

U.S.I. Introduces Three New Polyethylene Blow Molding Resins

New PETROTHENE Resins Produce Bottles of Excellent Appearance, Are Easy to Process

U.S.I. has developed three new PETROTHENE polyethylene resins with properties particularly suited to individual blow molding requirements. Two of the resins can also be used for injection molding. All have been evaluated by U.S.I.'s Polymer Service Laboratories and have been successfully field tested.

PETROTHENE 101 and PETROTHENE 102-2 can be used in both blow molding and injection molding, the first in applications requiring high stiffness and good stress crack resistance, the second in applications where stiffness and impermeability to liquids, oils, and gases is important. PETROTHENE 209-2 is designed for use in blow molding, especially for relatively small moldings with thick side walls.

Each of the resins is easy to process and produces bottles of outstanding appearance, good stress crack resistance and excellent low-temperature flexibility.

Lower Cost Per Container

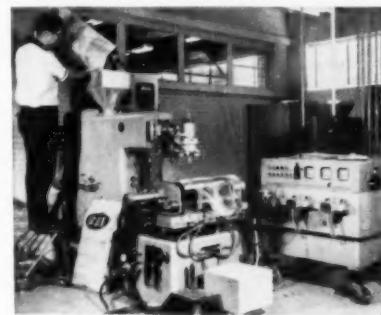
High stiffness and good stress crack resistance are the key characteristics of PETROTHENE 101 (density-0.924, melt index-2.0). This permits a reduction in wall thickness and consequently, a lower cost per container. Its torsional modulus of elasticity is approximately 18,000 lb/sq in. higher than the best of three other similar polyethylene resins commonly used for blow molding.

The stress crack resistance of PETROTHENE 101 was tested in an accelerated shelf-life test by filling thin-wall tubes molded of the resin with a commercial detergent and holding them at 120°F for 4 months. There were no container failures even though the metal closures were beginning to show signs of corrosion.

Carboys For Chemicals

High flow rate is the key characteristic of PETROTHENE 102-2 (density-0.924, melt index-2.0). This makes the resin particularly useful in blow molding pieces 6 to 20 oz. or heavier.

Because PETROTHENE 102-2 is also highly impermeable to liquids, oils and



Extrusion blow molding machine in operation at U.S.I.'s Polymer Service Laboratories, used for evaluating the new PETROTHENE molding resins.

gases, it is a desirable resin for blow molding large carboys for liquid chemicals. However, normal precautions should be observed in producing containers for chemicals which act as stress cracking agents.

Small Bottles a Natural

The excellent low-temperature flexibility of PETROTHENE 209-2 (density 0.920, melt index-3.0) makes it ideal for bottle blowing where the moldings are relatively small—under 10 oz.—and have thick sides. Its stress crack resistance is comparable to that of competitive resins used for the same applications. In field evaluations, cycle times with this resin were found to be faster than those of comparable resins. Yet seal strength at the parison pinch-off point—often a problem when blow molding cycles are shortened—is good.

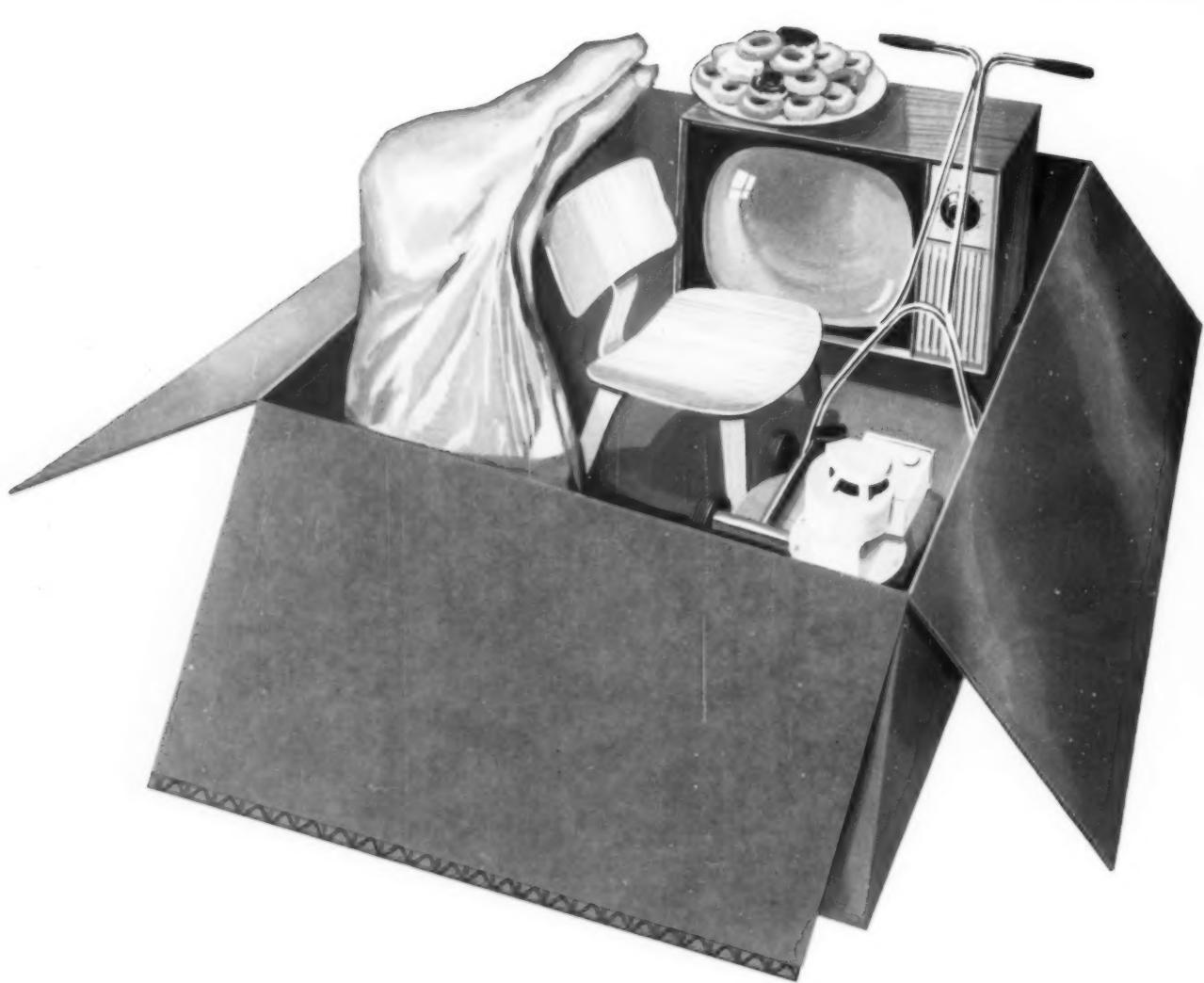
Data Available On Silk Screen Printing Machines

A manufacturer of machines for direct printing on polyethylene bottles and other containers is offering a brochure describing the company's line of equipment. The machines, which are automatic and semi-automatic, can print on flat, cylindrical and conical surfaces, and even on objects of awkward shapes. Multicolor printing is possible by printing one color and allowing it to dry before applying the next.

New Twin-Station Machine For Versatile Blow Molding

A new twin-station blow molding machine which permits simultaneous operation with either identical or different molds has been developed. For example, a toy can be blown in one station at the same time a two-quart bottle is being blown in the second station.

The machine's capacity is large, accommodating molds up to 36" by 21" wide and 28" daylight with a 12" stroke. Equipment is said to be safe, simple and low in cost to operate and maintain.



exceptional moisture and grease resistance

POLYETHYLENE-COATED KRAFT OPENS UP NEW OPPORTUNITIES FOR CORRUGATED BOARD

Polyethylene-coated corrugated board—produced on conventional corrugating equipment—is extending the usefulness of corrugated into many new packaging applications.

This unique container board has exceptional moisture and grease resistance and a glossy, non-abrasive liner surface that will not scratch or mar package contents.

Extruders who produce polyethylene-coated kraft liner board can get these extra advantages by using U.S.I. PETROTHENE® polyethylene resins:

HIGH PRODUCTION RATES—PETROTHENE resins have good drawdown properties, permit extrusion at high speeds.

EXCELLENT ADHESION—with minimum hot melt oxidation.

NO ODOR—an important consideration in many packaging applications.

Contact U.S.I. for information on PETROTHENE resins especially suited for coating kraft liner board.

Packagers are investigating polyethylene-coated corrugated board for applications like these:

Bulk shipment of meat, where moisture and grease-proof interiors reduce weight loss of the meat and keep moisture from weakening the carton.

Shipment of furniture and other hard goods, where abrasion damage from the container has been a problem.

Bulk bakery and confectionery shipments, where absence of grease-wickage makes containers suitable for reuse as point-of-sale displays.

In concrete construction forms, where the polyethylene coating acts as a release agent.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N.Y.
Branches in principal cities



Series V, No. 3

POLYETHYLENE PROCESSING TIPS

FACTORS AFFECTING ADHESION IN EXTRUSION COATING

In the polyethylene extrusion coating process, the nature of the bond between coating and substrate can be chemical, physical or a combination of both. Chemical bonding is involved almost exclusively when the substrate is a non-porous material such as foil or cellophane. With porous substrates such as paper or board stock, physical as well as chemical bonding takes place.

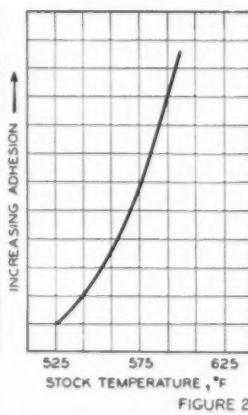
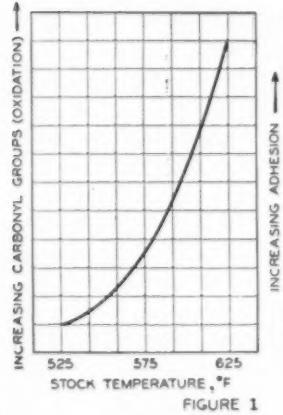
Physical bonding results from the absorption of the molten polymer by the substrate pores. The degree of adhesion is primarily a function of the polyethylene melt index and the surface characteristics of the substrate.

Resins of lower viscosity, which flow more freely, bond more firmly than do higher viscosity resins. The more porous the substrate, too, the better the physical bond will be.

Oxidation Improves Chemical Bonding

Chemical bonding depends on the number of carbonyl (CO) groups on the coating surface at the moment of contact with the substrate. Since carbonyl groups are formed by oxidation of the polymer, conditions which promote oxidation generally result in improved adhesion.

Heat has the greatest effect on oxidation; hence, stock temperature control is important. Figure 1 shows that increasing stock temperature produces an increase in carbonyl groups on the polymer surface. Figure 2, the curve showing the effect of stock temperature on adhesion, is almost identical.



A minimum stock temperature of 575°F. is necessary for adequate adhesion in most operations. This value is based on extensive research

in the Polymer Service Laboratories of U.S.I. As a rule, temperatures above this are recommended.

The operator, however, must not work at temperatures high enough to cause excessive oxidation. If he does, the polymer will be degraded badly and its heat sealability impaired. Using the above minimum value as a guide, he must determine for each application a stock temperature that will give maximum adhesion without serious degradation.

Controlling Coating Temperature

Several other operating variables affect oxidation of the polymer. Increasing the coating speed allows less time for oxidation to occur, and therefore decreases adhesion. Conversely, heavier coating weights improve adhesion by slowing the cooling time of the molten web. Preheating the substrate has the same effect.

Adjusting Coating Equipment

One measure of coating quality is uniformity of adhesion across the entire width of the substrate. This can be achieved only by careful alignment of the extrusion coating equipment. Chill and nip rolls must be parallel in the same horizontal plane, and the die must be in a plane parallel to the nip.

Pressure applied by the rubber pressure roll should be uniform across its width. And excessive pressure should be avoided since it contributes little to bond strength.

Picking the Right Resin

Good adhesion also depends on the choice of the right resins. Many resins that are excellent for film extrusion, for example, are not quite so good for extrusion coating. U.S.I. has developed the following series of "Petrothene"® resins specifically for the coating process. These resins have excellent coating characteristics and their oxidation is easy to control.

PETROTHENE® Resin	Melt Index	Density	Recommended Coating Weight (Lbs. per 3000 sq. ft.)
200-2	3.0	0.915	20 and higher
201-2	5.0	0.915	10 to 25
203-2	8.0	0.915	3 to 15

U.S.I. Technical Service Engineers are ready to help you select the best resin and operating conditions for your application. Just give us a call.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.,
99 Park Ave., New York 16, N. Y.
Branches in principal cities

GUIDE TO PETROTHENE POLYETHYLENE RESINS

RESINS SUGGESTED FOR FILM EXTRUSION

APPLICATION	GAUGE (MIL)	ESSENTIAL PROPERTIES	SUGGESTED PETROTHENE RESINS
BLOWN FILM			
Garment bags	0.4 to 0.75	Excellent draw-down, excellent clarity, high gloss, resistance to blocking, good slip	207, 239, 240-22
Soft-goods bags	0.75 to 1.25	High draw-down, high clarity, good gloss, resistance to blocking, good slip, fair toughness	112, 206, 207
Produce bags			
small	1 to 1.25	Moderate toughness, clarity, gloss, resistance to blocking, good slip	205, 210
small or large	1 to 2	Very high toughness, clarity, gloss, resistance to blocking, good slip	112
large	1.5 to 2	High toughness, fair clarity, gloss, resistance to blocking, good slip	200, 205, 210
Chemical packaging bags (drum liners)	1.5 to 3	Very high toughness, resistance to blocking, good slip	200, 204
Construction	4 to 6	Extreme toughness	200, 301
FLAT FILM, CAST & WATER QUENCHED			
Soft-goods	0.75 to 2.0	High draw-down, clarity, gloss, resistance to blocking, good slip	239, 112
Overwrap	0.75 to 2.0	Excellent clarity, gloss, resistance to blocking, high stiffness	218
Breadwrap	1	Excellent clarity, gloss, stiffness	218
Produce bags	1 to 2	Excellent strength, clarity, gloss, resistance to blocking, good slip	112
Frozen vegetables	2 to 2.5	Extreme toughness, low temperature flexibility	200
Skin packaging	2 to 6	Extreme toughness, good appearance	205, 200
AGRICULTURAL FILM	Mulch	Moderate toughness, high draw-down	109-216, 201-210

RESINS SUGGESTED FOR OTHER APPLICATIONS

USE	ESSENTIAL PROPERTIES	SUGGESTED PETROTHENE RESINS
PAPER COATING	Good draw-down, freedom from odor, good adhesion, grease proofness, heat sealability Best draw-down Highest resistance to permeability Minimum "neck-in"	203-2 205-15, 239-2 201-2, 201-63, 205-15
WIRE AND CABLE COATING	Excellent dielectric properties Excellent resistance to environmental stress cracking High frequency insulation, power cables Wire and cable jackets, where unusual stress crack conditions are encountered Primary insulation for telephone cables, general insulation where color coding is required Good resistance to environmental stress cracking Neon sign cable (GTO-15) High frequency coaxial cables; primary insulation for telephone cables, multi-conductor control cables, power cables Weather resistant wire and cable; neutral supported secondary and service drop cable WD-1/TT Infantry field wire Primary insulation for telephone cables; general insulation where color coding is required General-purpose applications Non-critical, non-specification insulation TV antenna lead-in wire	300-6 300-200 300-Color Code 301-3 301-6 301-200 301-202 301-Color Code 302-6 302-506, 304-516
INJECTION MOLDING	Fast flow, maximum stiffness Size: Very large (> 20 oz) Very large (> 20 oz), high resistance to low-temperature brittleness and shattering Large (10 to 20 oz) Small (6 to 10 oz) Very small (< 6 oz) Best transparency and gloss Best freedom from warp (low level of locked-in stresses)	208 202 202, 203, 207, 208 201, 203, 206, 207, 239 200, 204, 205, 240 101, 207, 208, 209-2, 241 202
BOTTLE BLOWING	Best appearance Highest environmental stress cracking resistance	101, 102-2, 201, 206 101, 102-2, 301
THERMOFORMING	Stiffness, chemical resistance, low water absorption Maximum resistance to sag High stiffness and thin walls Optimum toughness and great flexibility Good balance of end properties	205, 239 239, 301 239 301 205
PIPE EXTRUSION	NSF approved for potable water Nonpotable water supplies	102-216, 109-216 550-218
CALENDERING		102, 102-216, 109-216

FORM: Solid cubes approximately 1/2" on a side.

COLOR: All PETROTHENE types are available in various colors as well as natural.

PACKAGING: 50 lbs. polyethylene coated multi-wall bags, 10,000-lbs. collapsible rubber Sealdbins or 100,000-lbs. Dry-Flo railroad cars.

MINIMUM ORDER: 50 lbs.

TERMS: Net 30 days.

AVAILABILITY: Warehouse stocks are maintained in most major processing areas. Your nearest U. S. I. Sales Office will give you detailed information on delivery dates.

TECHNICAL SERVICE: For technical assistance contact your nearest U. S. I. Sales Office.

U.S.I. INDUSTRIAL CHEMICALS CO.

Division of National Distillers and Chemical Corp.

99 Park Ave., New York 16, N. Y.

Branches in principal cities



in fiberglass boat
construction the
swing is to...

FLIGHTEX GLASS CLOTH

AND TAPES

And no wonder! For Flightex manufactures a complete line of cloth for every type of boat. You'll find working with FLIGHTEX GLASS CLOTH saves time, saves labor. Result: a rugged, beautiful boat at less cost.

Is it any wonder that in fiberglass boat construction...the swing's to FLIGHTEX?

Easy to handle — conforms to contours of hulls and decks

Long lasting, durable, trouble-free

Uniformity in weight, weave and thickness

Maximum strength of reinforcement

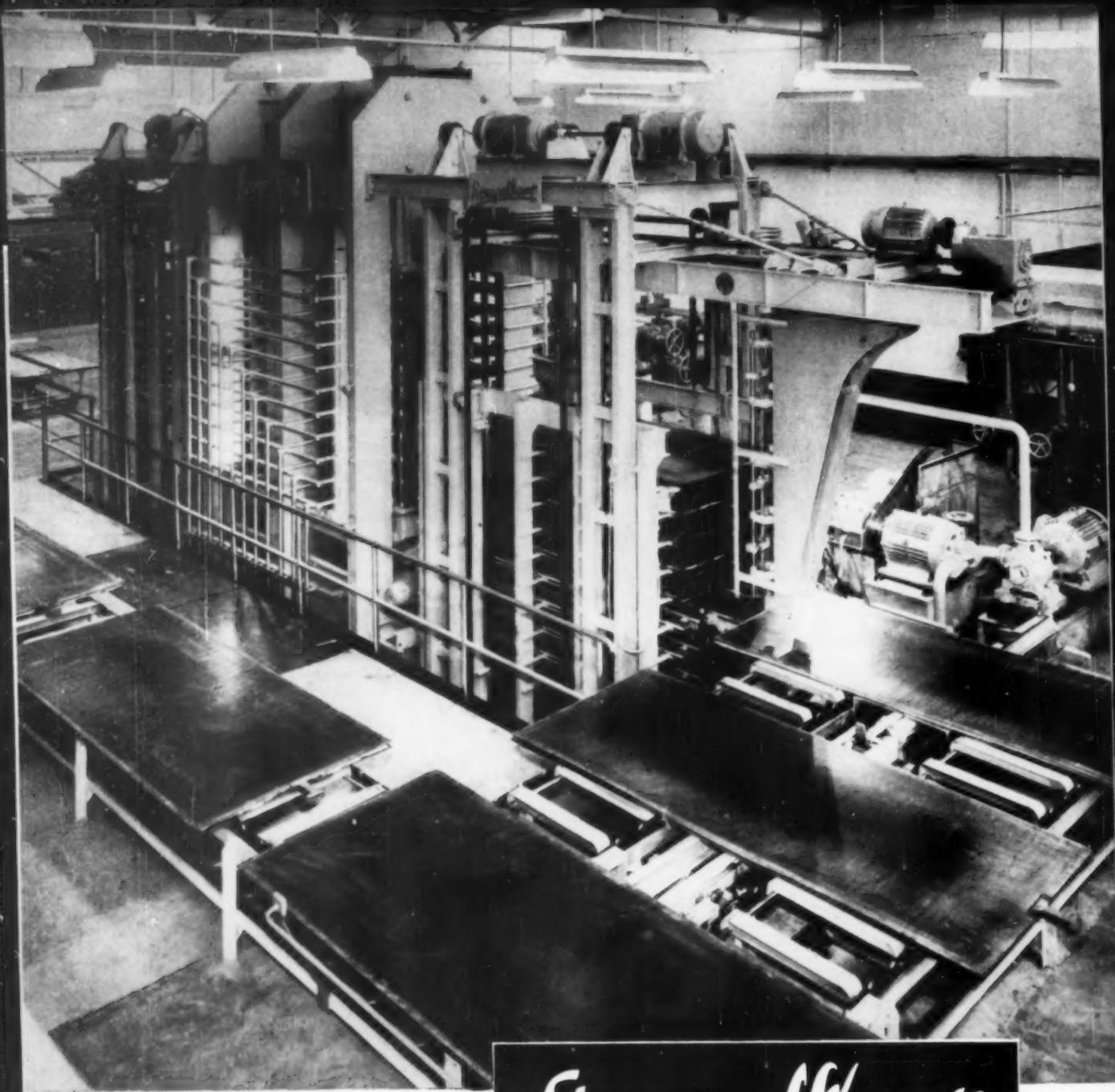


Write for our Specification Guide.



FLIGHTEX FABRICS, INC.

93 Worth St. New York 13, N. Y.



Siempelkamp

**Special hydraulic
presses**

for the plastics industry
for any pressure and temperature
with automatic loader and unloader

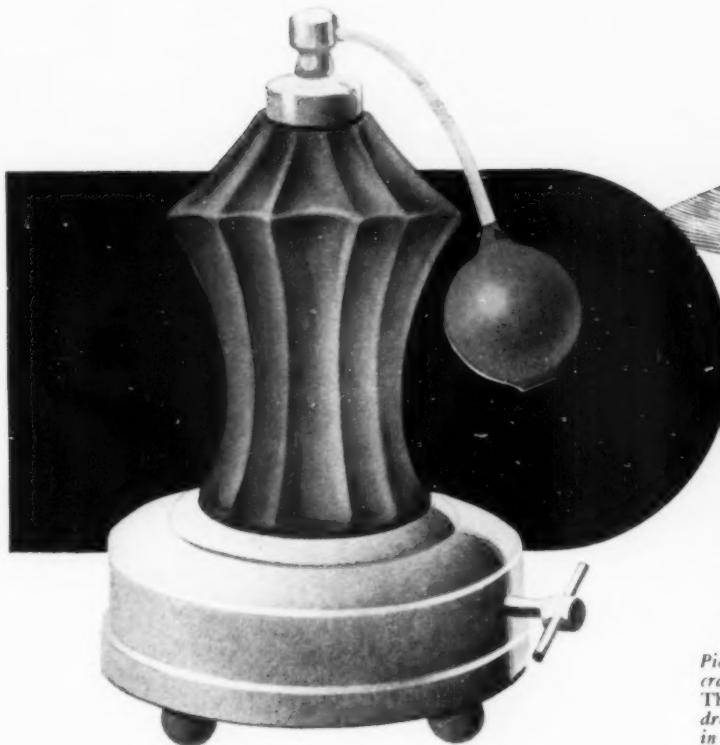
Largest Manufacturer Specialising in Steam Heated Presses

G. Siempelkamp & Co. · Maschinenfabrik · Krefeld Western Germany
Cable address: Siempelkampco

Teleprinter: 085 3811

masters in the field of

GOLOB



THE DESIGNER BY JAQUET-DROZ
Pierre Jaquet-Droz, of Switzerland, was a superb craftsman of mechanical toys and music makers. The Designer, which he built in 1774, actually drew different pictures . . . and is still doing so in a Swiss museum.

Like craftsmen of all eras, modern color formulators combine aesthetic judgment with high technical skills. At Westchester these standards of unusual workmanship have guided the formulation (since we opened shop in 1946) of more than 4000 different color concentrates and pre-mixed color blends. Today, as in the past, Westchester formulates colors with craft and scientific precision . . . colors that do not degrade or migrate . . . colors that exhibit excellent temperature and flow characteristics

Write now for detailed information on any color problem involving linear and conventional polyethylenes, polypropylenes, and other thermoplastics.



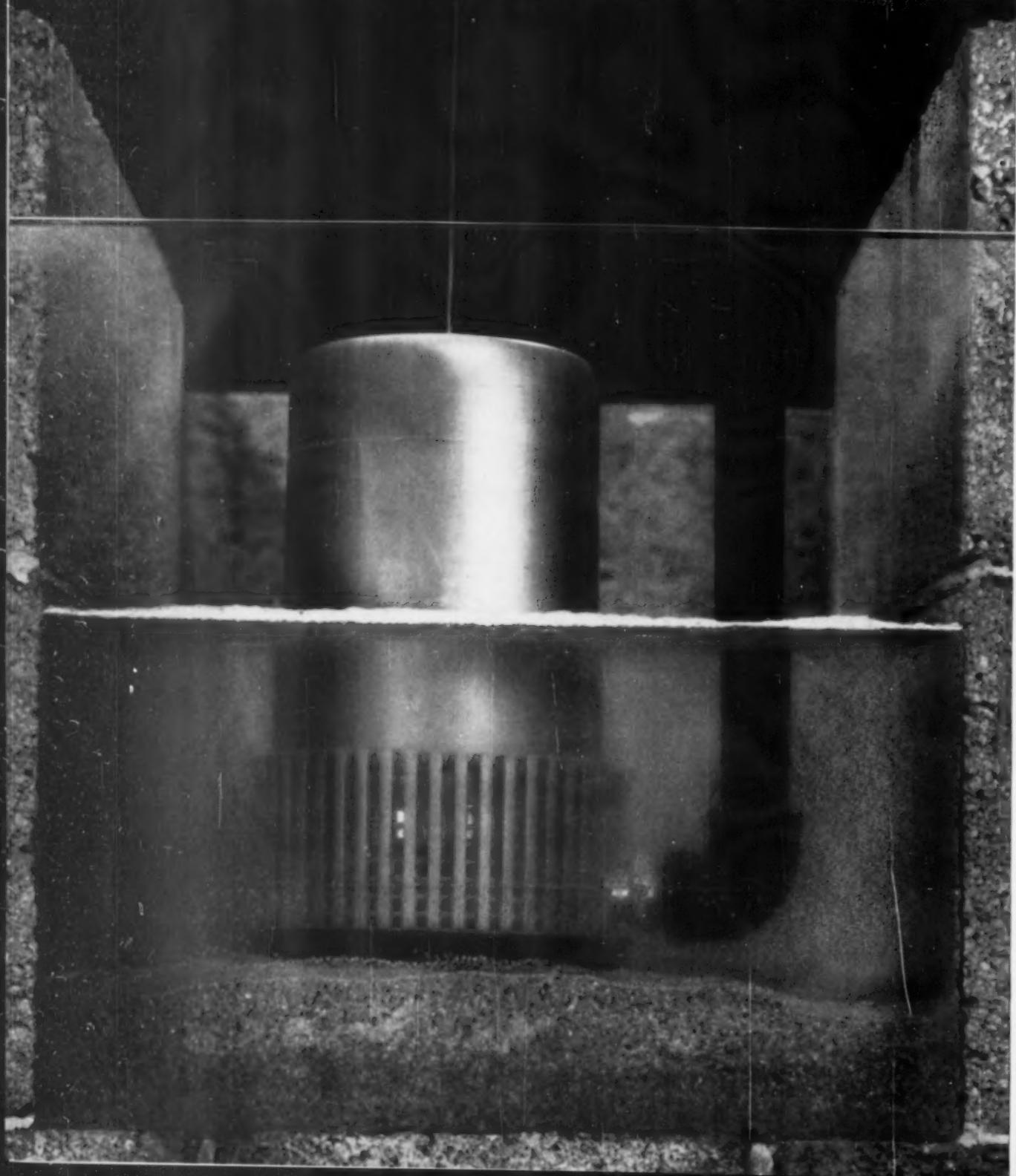
WESTCHESTER PLASTICS, Inc.

326 WAVERLY AVENUE, MAMARONECK, N. Y. • OWens 8-7410
Custom Compounders of Polyethylene Molding Powder and other Thermoplastic Materials
Manufacturer and Developers of Unicel and Farmacel® Plastane, Farmacel, Unicel® T.M. Reg. U.S. Pat. Off.

JUNE 1960

71

CORROSION RESISTANCE...



...another way high-density polyethylene IMPROVES YOUR PRODUCT

TYPICAL PROPERTIES OF DMD-6001

Properties	ASTM Test	Typical Value
Density, gm/cc	D 1505	0.950
Melt Index, gm/10 min.	D 1238	2.0
Tensile Strength, psi	D 638	3,400
Elongation, %	D 638	45
Secant Modulus (Stiffness), psi	D 638	100,000
Hardness, Durometer "D"	D 676	60



Fostoria "Dynasumps", designed for rigorous underwater service, are housed in covers molded of BAKELITE Brand high-density polyethylene DMD-6001. The cover-strainers are molded by Haas Corporation, Mendon, Michigan.

DRAINAGE WATER CONTAINING harsh detergents and common corrosives can be a problem for sump pumps, but Fostoria Corporation's new submersible "Dynasump" is highly resistant to household chemicals. An integral component of this non-corrosive construction is the combination cover-strainer molded of BAKELITE high-density polyethylene DMD-6001.

Tough and rigid, this high-density polyethylene also contributed to Fostoria's new design concept. These properties, along with the excellent molding characteristics of DMD-6001, made this complex, one-piece molding possible; details are clean and sharp. The result is a durable, functional, good-looking part that meets every requirement at low cost.

Finding the right combination of polyethylene properties is made easier by the variety of BAKELITE Brand polyethylene formulations available today. In addition to the low, medium, and high densities, the list also includes the remarkable new polyethylene copolymers. Such properties as stress-cracking resistance, moldability, dimensional stability, toughness, flex life and rigidity can be specified in the degree you require.

And to help in applying the properties of these materials to your product, you can call on the same technical knowledge and experience that developed them. Mail the coupon today, or write a description of your requirements directly to Dept. BL-87, Union Carbide Plastics Company, Division of Union Carbide Corporation.

"Bakelite" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

**UNION
CARBIDE**

Dept. EL-87
Union Carbide Plastics Company
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N.Y.

Please send me information on BAKELITE Brand high-density polyethylenes with particular emphasis on these properties
the application being considered is

Name _____

Firm name _____

Street _____

City _____ State _____

EVERYTHING For Polyester Hand Lay-Up Molding FROM ONE SOURCE!

Whatever your hand lay-up problem, there is an IC* Polyester Resin that is RIGHT for the job and a complete line of accessory products to go with it.

Make Interchemical your one-stop source for:

- Fast wetting, fast curing lay-up resins, both air-inhibited and non air-inhibited. • Gun resins for use with chopped glass fibers.
- Low exotherm resins for unitized, multiple lay-ups.
- Tinted resins to aid in spotting air entrainment.
- Hi-hiding, easy-working gel coats.
- Color concentrates. • Balsa wood paste.
- Sanding aids. • Thixogel® for obtaining thixotropy.
- Release coatings. • Activators and other accessories.
- Experienced technical service on hand lay-up problems.

Write TODAY on your company letterhead
for the IC Hand Lay-Up Brochure.

PHOTO
COURTESY OF
BOCK BOATS, INC.
TOLEDO, OHIO



Interchemical
CORPORATION
Finishes Division

Commercial Resins Department—1754 Dana Ave., Cincinnati 7, Ohio. Headquarters Office: 224 McWhorter St., Newark 5, N.J. Factories: Chicago, Ill. • Elizabeth, N.J. • Cincinnati, Ohio • Los Angeles, Calif. Newark, N.J. • Mexico City, Mex. In Canada, these polyester resins are made by Chemical Oil & Resin Company, Toronto, Ontario and sold under its trademarks. *IC and Thixogel are trademarks of Interchemical Corporation.



These
5 tests
prove that
NEW Advance
BC-200 and BC-206
are the only
barium-cadmiums
that will pass
all your requirements
with flying colors



PROVE IT YOURSELF

1 Color Control Substitute BC-200 or BC-206 for present liquid Barium-Cadmium or Barium-Cadmium-Zinc stabilizer. Work continuously on 2-roll mill at suitable fluxing temperatures, removing samples at fixed intervals. Compare color maintenance to present stabilizer.

2 Over-all Heat Stability With identical formulations, except for the stabilizer, use oven or continuous mill test. Compare BC-200 or BC-206 with stabilizer currently being used.

3 Clarity Press-mold a thick milled section or laminate milled films to a thickness in excess of 0.100. Compare BC-200 or BC-206 with present Barium-Cadmium or Barium-Cadmium-Zinc system, for crystal clarity.

4 Extended Aging or Storage Stability Prepare milled films containing BC-200 or BC-206, as well as films containing presently used stabilizers. Expose 10 cc. of each stabilizer to uniform air surface area. Allow to age for any desired time interval at room temperature or slightly elevated temperature and/or humidity. Compare aged stabilizers in milled films to the films containing the fresh stabilizers. Oven test all films simultaneously. Note degree of performance loss for each stabilizer.

5 Formulation Versatility Compare BC-200 or BC-206 to present Barium-Cadmium or Barium-Cadmium-Zinc stabilizer, in formulation with and without phosphate plasticizer. Compare stabilizer versatility with lubricants other than stearic acid. Use oven or mill test.

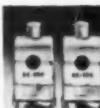


 Div. of Carlisle Chemical Works, Inc., Reading, Ohio

Four ounces of positive
proof can be yours!

Simply fill out this
coupon and mail to:
**ADVANCE SOLVENTS
& CHEMICAL**

Dept. MP, 500 Jersey Avenue
New Brunswick, N. J.



Advance Solvents & Chemical
Dept. MP, New Brunswick, N. J.

Gentlemen: Yes, I would like to prove it myself.
Please send me samples of both BC-200 and BC-206.

Name

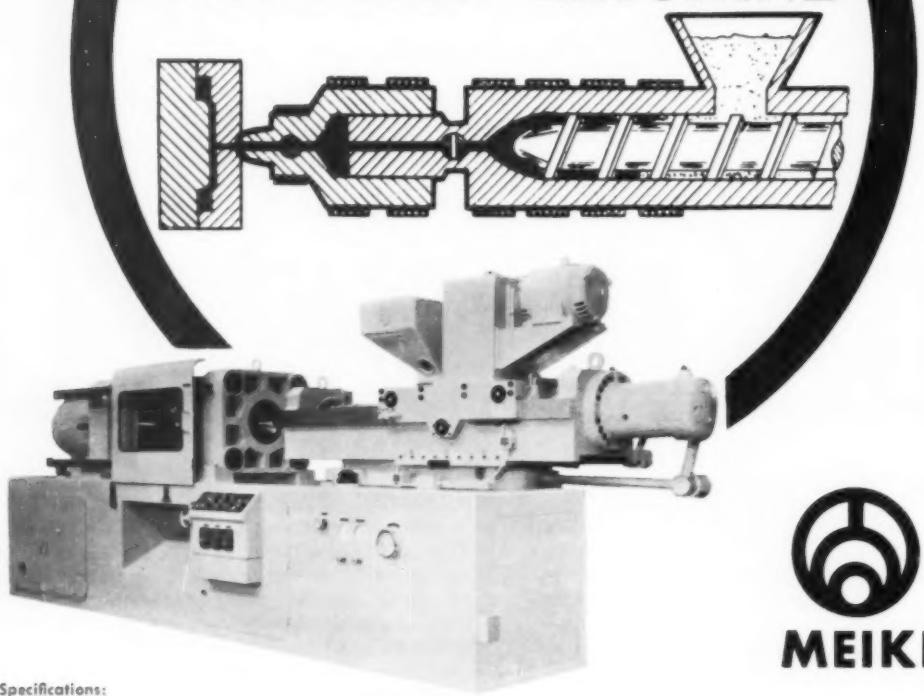
Title

Company

Address

City Zone State

TPS Type
DYNA-MELT
 Plastics
INJECTION MACHINE



MEIKI

Specifications:

	Polystyrene	Hard vinyl
Screw dia. (mm)	76.2	76.2
Screw length (mm)	830	830
rpm (50Hz) (60Hz)	35-58(30-48)	35-58(30-48)
Electric motor kw(hp)	7.5(10) x 4p	7.5(10) x 4p
Injection capacity gr/oz	880(30)	1100(37)-590(21)
Injection pressure (kg/cm ²)	1,500	1,500-2,900
(psi)	(21,000)	(21,000-39,000)
Clamping force (ton)	275	275
Max. size of mold, Hori. (mm)	450 x 700	450 x 700
Vert. (mm)	400 x 750	400 x 750

MEIKI CO., LTD.

1, 2-chome, Shioiri-cho, Mizuho-ku,
 Nagoya, Japan
 Cable: MEIKILTD NAGOYA

for textiles,
plastics, paints,
inks and rubber

HELIOPEN[®] VIRIDINE 66-6001

simplifies and improves
color formulation

Heliogen Viridine 66-6001 is the yellowest green phthalocyanine pigment currently available. Now, without blending, you can obtain the bright, vibrant, yellow-green shade you desire with all the excellent fastness properties of the phthalocyanines. Heliogen Viridine 66-6001 will effectively simplify your procedures and improve the color qualities of your product.

For use in the coloring of textiles, plastics, paints, inks, and rubber, this yellowest green pigment offers these notable properties:

- excellent lightfastness • excellent stability to acids and alkalies • insoluble in organic solvents • heat stable at high molding temperatures • fine dispersing qualities • non-dichromatic • high tinctorial strength

To meet individual requirements, Heliogen Viridine 66-6001 is supplied as: toner, presscake, dispersed powder, lakes, aqueous dispersions, and flushed in suitable vehicles.

Give your products extra sales appeal with a fresh, vital new shade — Heliogen Viridine 66-6001. For competent technical assistance and service write or call your nearest GDC representative.



From Research to Reality

This advertisement printed with Heliogen Viridine 66-6001.



PIGMENT DEPARTMENT

GENERAL DYESTUFF COMPANY

A SALES DIVISION OF

GENERAL ANILINE & FILM CORPORATION

435 HUDSON STREET • NEW YORK 14, NEW YORK

CHARLOTTE • CHATTANOOGA • CHICAGO • LOS ANGELES • NEW YORK • PHILADELPHIA
PORTLAND, ORE. • PROVIDENCE • SAN FRANCISCO • IN CANADA: CHEMICAL DEVELOPMENTS
OF CANADA LTD., MONTREAL

Heliogen Viridine 66-6001 manufactured by General Aniline & Film Corporation is sold outside the United States and Canada under the trade name Fenalac Viridine Y by distributors all over the world.

WE'RE MIGHTY PROUD OF OUR PARADE

Doughboy

Firestone

U. S.
NAVY

ALCOA
ALUMINUM

There's a special
Sealomatic
machine for
everything: from
books and binders
to air mattresses
and door panels!
(Sealomatic 30 KW
illustrated)



You may never see them coming down the avenue behind a colorful band... six majorettes... or a platoon of the finest, with flags flying... BUT, a parade of their names swells our corporate breast with pride... BECAUSE these are the leading manufacturers in their respective lines who buy and rely upon SEALOMATIC Dielectric Welding Machines to fabricate their vinyl products - faster, better, more economically - all trouble-free!

Manufacturers who weld vinyl owe it to themselves to see how SEALOMATIC can help them to greater sales and profits through efficient, economical, specialized vinyl welding equipment.

Call or Write today for your copy of SEALOMATIC '60 - our new illustrated and informative catalog.

Remember - our Engineering Consultation Service is available to you at all times - merely upon request.

SEALOMATIC
Electronics Corporation

SEALOMATIC ELECTRONICS
CORPORATION

SCOTT AVENUE & RANDOLPH STREET, BROOKLYN 37, N. Y. • GLENMORE 6-8080
1362 Jean Talon St. East, Montreal 35, P. Q., Canada • CRescent 4-8274



DAPON (diallyl phthalate) RESIN GIVES A LIFETIME SHRINKAGE VALUE OF .001 IN THIS AMPHENOL CONNECTOR

This connector routes many circuits in the Bell System's multi-line "Call Director" at a great saving of space and weight.

About the size of a cigarette lighter, an Amphenol-Borg Electronic Corporation connector is used in the Bell System's "Call Director." This versatile telephone can handle as many as 29 outside lines or extensions. The working members of this connector are fifty gold plated bronze contacts held firmly in a body molded from DAPON (diallyl phthalate) Resin.

Chosen by Amphenol for this application because of its dimensional stability and insulating properties, DAPON's superior moldability accommodates the thick and very thin sections and lateral cavities of the connector's body. DAPON molds easily around metal inserts; there is no cracking and little or no after-shrinkage of DAPON molded parts after years of service, even under elevated temperatures.

Specify DAPON (diallyl phthalate) Resin when you need:

- Low dielectric loss
- High dielectric strength
- Superior dimensional stability
- Excellent arc resistance
- High volume and surface resistance after high humidity-high temperature conditioning

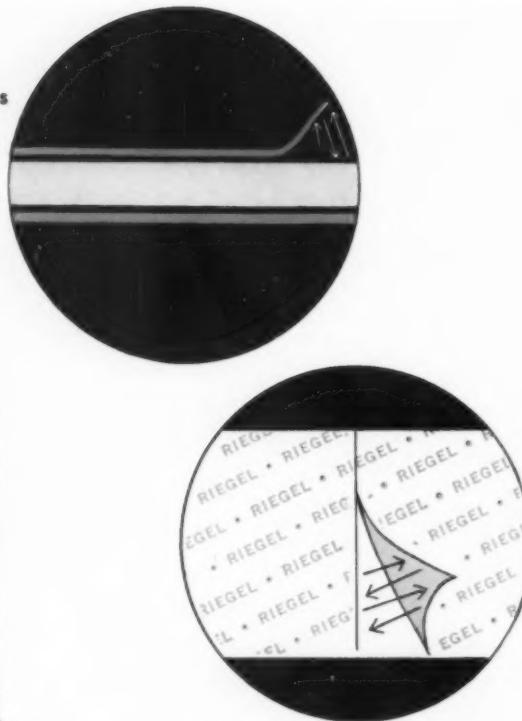
Write to the address below for FMC's data sheet containing technical information about DAPON, suggested uses for this resin, and the name of the DAPON compounder nearest you.



FOOD MACHINERY AND CHEMICAL CORPORATION

Dapon Department

161 East 42nd Street, New York 17, New York



...use **Riegelease*** paper

Releasing papers for pressure-sensitive adhesives must safeguard the adhesive tack . . . and must peel easily when needed without picking.

But every adhesive is different. Even the same adhesive varies, depending on the base material to which it's applied, as well as the processes and the type of coater used by the converter. It takes careful testing to find the exact release paper that will be most satisfactory.

The same is true in separating papers for plastic laminates, film casting papers, foam casting papers, container liners, and interleaving papers for rubber in process, caulking compounds and other tacky materials.

For over 15 years, users of pressure sensitive adhesives have been coming to Riegel to assist them in solving release paper problems. Riegel's pioneering laboratory and production experience is the most important reason why it pays you to call Riegel first.

Riegelease is available in numerous weights with a variety of coatings for adhesives and tacky substances. Coated one or two sides, on colored papers, and printed if desired.

Send today for FREE Riegelease Selector Manual

.....write to:

Technical Advisory Service
Riegel Paper Corporation
Box 250, New York 16, N. Y.

OVER 600 RIEGEL PAPERS

Release papers for
pressure sensitive adhesives

Casting papers for films,
adhesives and polyurethane foam

Separating papers for plastic laminating
Interleaving papers for tacky materials

Resin-impregnated papers

Heat-seal coated papers

Laminations of
paper, film or foil

Polyethylene extrusions
on paper, film or board

Riegel

INJECTION MOLDING MACHINES

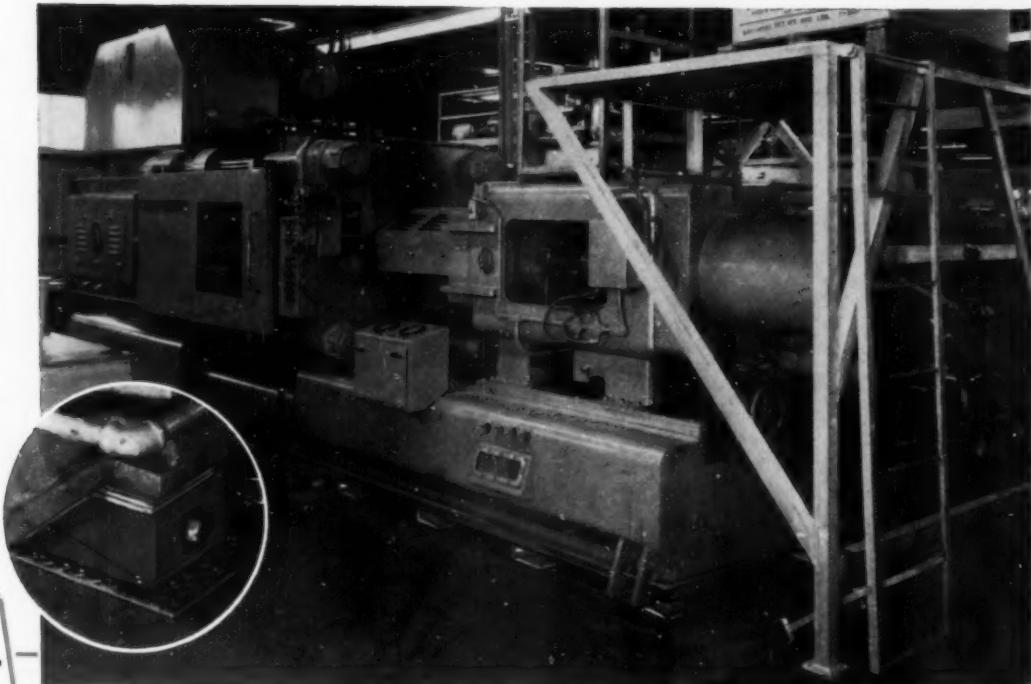
✓STAY LEVEL ✓STAY PUT

when you install them on the new



WEDG MOUNT

with patented vinyl, sisal, and cork Air-Loc top and bottom.



NEW FOLDER describes the WEDG MOUNT method, gives sizes available for various types of machines.

HPM #800 H-18 Injection Molding Machine installed on twenty WEDG MOUNTS Type S, each 4" x 8". Mounts were installed under the 87,000 lb. machine, adjusted to a level position, and machine is operating perfectly.

No more bolting machines to the floor, now you can have real production flexibility, plus the benefits of greatly reduced machine vibration. Look into WEDG MOUNT today. It is the fastest known method for precision installation of molding machines.

- KEYED CONSTRUCTION
prevents movement within mount
- DOUBLE-WEDGE CONSTRUCTION
gives immediate precision leveling
- AIR-LOC TOP AND BOTTOM
grips machine to floor
- ADJUSTMENT BOLT
permits fast, easy installation

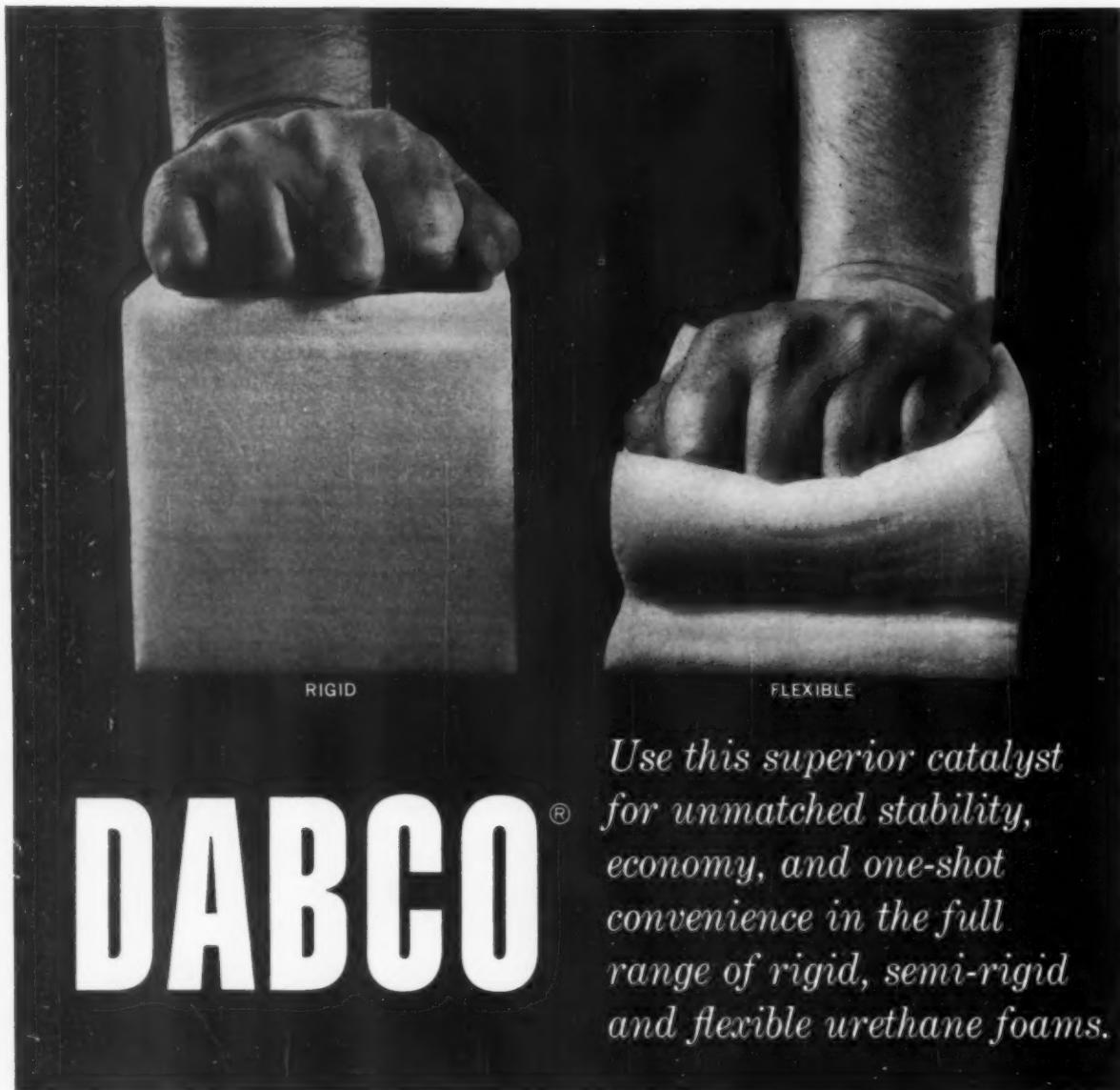


WEDG MOUNT

is manufactured by

CLARK, CUTLER, McDERMOTT CO.

125 WEST CENTRAL STREET, FRANKLIN, MASS.



DABCO®

Use this superior catalyst for unmatched stability, economy, and one-shot convenience in the full range of rigid, semi-rigid and flexible urethane foams.

Use DABCO with any urethane grade polyol for:

Rigid Foams—DABCO assures complete catalysis of the highly functional polyols used in rigid formulations. This results in low K factors, good retention of chlorofluorohydrocarbon and dimensional stability.

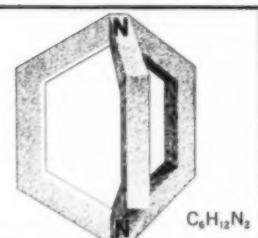
Flexible Foams—Manufacturers of flexible foams depend on DABCO to assure continuous production of uniform, fast curing, stable, and odorless foams.

Economy—DABCO's high activity and unique performance results in economy with no sacrifice of optimum foam properties. From High Point to The Hague authorities agree DABCO is the economical key to better foams.

Elastomers and Coatings—DABCO makes possible fast room temperature cures and improves overall physical properties.

*Houdry means progress . . . through Catalysis

Write for technical data and commercial price schedule on DABCO.



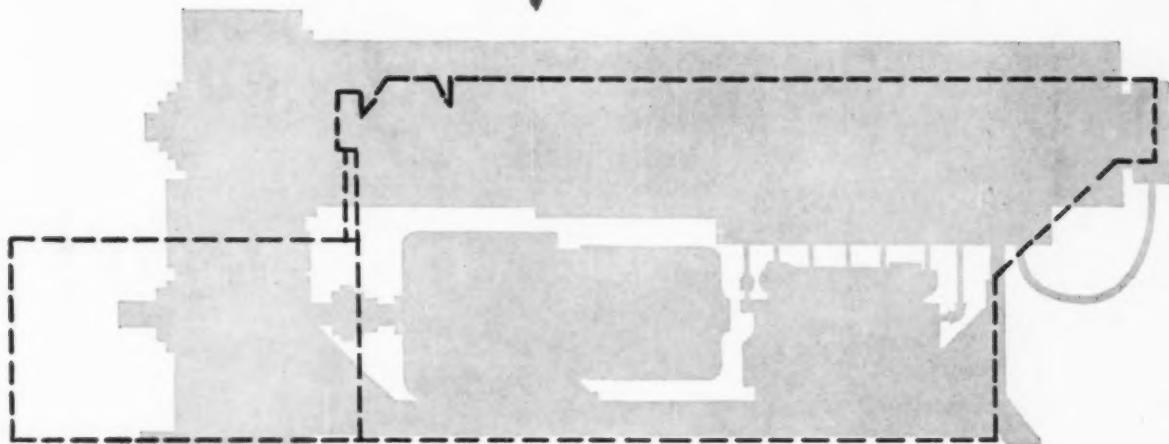
***HOUDRY**
PROCESS CORPORATION

1528 Walnut Street, Philadelphia 2, Pa.

NOW...

3½ times more production in
the same extruder floor space
with

NRM *Pacemakers*



Comparative space requirements of NRM 4½" Pacemaker and competitive 2½" extruder. NRM's Pacemaker, with TUCK-UNDER drive, saves valuable floor space.

Compare dimensions. You'll find that you can install a 4½" NRM Pacemaker with TUCK-UNDER drive in less space than that required by an in-line driven 2½" extruder. You'll get up to 3½ times more product output, without capital expenditure for additional extruder floor space.

What's more, you can select the Pacemaker best suited to your present requirements. Interchangeable thrust bearing and drive gear components are offered in a wide range of capacities . . . you have a choice of Temp-Flo liquid or balanced air cooling and induction or resistance heating, to assure close control and highest product quality. Pacemakers are offered in 3½", 4½" and 6" sizes, 20:1 and 24:1 L/D ratios, vented or unvented. Call, wire or write NRM today . . . find out how Pacemaker extruders fit into your present and future plans.

2194-A

NRM

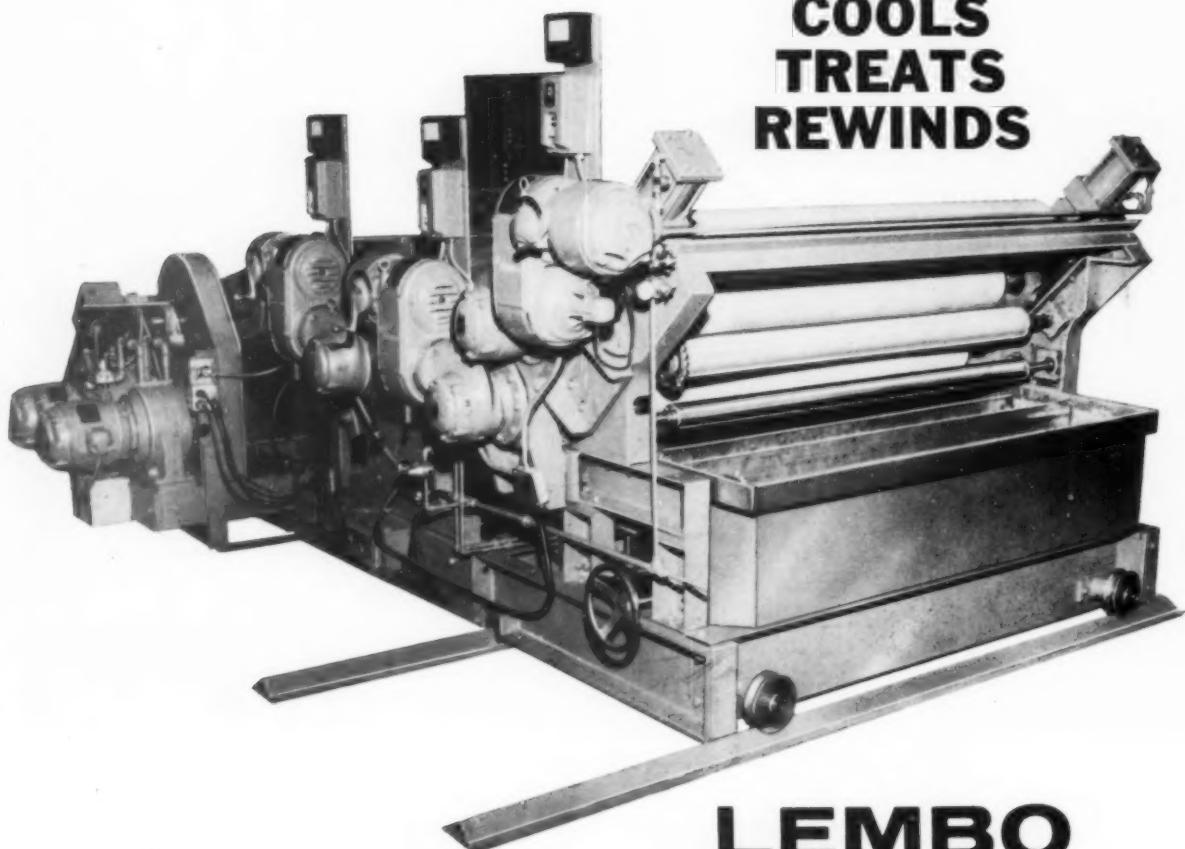
RUBBER AND PLASTICS
PROCESSING EQUIPMENT

NATIONAL RUBBER MACHINERY COMPANY

General Offices: 47 WEST EXCHANGE ST. • AKRON 8, OHIO

triple-
FILM HAUL-OFF
duty

**COOLS
TREATS
REWINDS**



At the critical final stages of film processing, you should have the versatile Lembo Film Haul-Off for uniform quality at low-cost. Components include: (a) Bath-type cooling or casting roll units, (b) film treating and slitting unit, and (c) turret rewind with automatic cut off.

Each component section is track mounted and equipped with its own variable speed drive to assure uniform film tension control. Hard straight edge rolls without telescoping. For precision finishing of polyethylene and other film, we suggest you look to Lembo.

There is only one Lembo Machine! Be cautious of "Lembo-type" imitations.

LEMBO
MACHINE WORKS, INCORPORATED

248 EAST 17TH STREET
PATERSON 4, NEW JERSEY
LAMBERT 5-5555

Cable Address: Lemco, Paterson
Mfrs. PRESSES • EMBOSSEERS
LAMINATORS • ROLLERS



AIR-BORNE SERVICE
Private fleet speeds our engineers
and field service experts to you.

it drives*



CYCOLAC®

THE BORG-WARNER PLASTIC THAT'S TOUGH, HARD, AND RIGID

Every year, the auto industry finds new applications for CYCOLAC—to the tune of important savings and an improved appearance for many products.

The 1960 Chrysler instrument panel you see above is a typical example.

This unique panel, molded of Borg-Warner CYCOLAC, cuts production costs because it replaces expensive die-cast metal with economical molded plastic.

It also replaces chrome plating with vacuum plating . . . another cost-economy. Product-appearance is improved because the toughness, hardness and rigidity of CYCOLAC enable it to keep its "like new" look for many years.

CYCOLAC Better in more ways than any other plastic

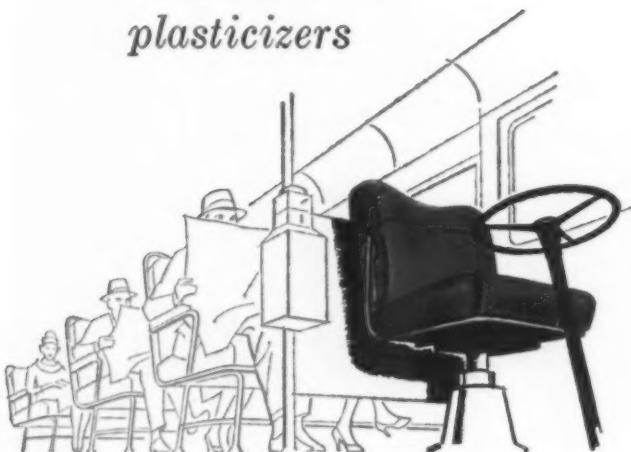
GET THE FACTS—WRITE TODAY!

MARBON CHEMICAL
WASHINGTON



DIVISION **BORG-WARNER**
WEST VIRGINIA

Grueling use-test pits monomeric vs. polymeric plasticizers



Some years ago a vinyl upholstery manufacturer decided to field-test new materials for truck and transportation upholstery using a wide variety of monomeric and polymeric plasticizers, including Plastolein 9720. To compare *permanence* and *durability*, the different materials were installed on city bus drivers' seats.

Here, seat upholstering would certainly be exposed to extraordinary abuse almost around the clock... continuous rubbing and flexing, city grime and grit, oil and grease.

After a certain period of time, all the upholstery containing monomeric plasticizers had failed. But all those made with polymerics, including Plastolein 9720, were still in excellent shape. With this evidence, the manufacturer concluded that only a polymeric plasticizer would meet its standards for truck and transportation upholstering, and protect its reputation. And Plastolein 9720 was chosen on the basis that it was the *lowest cost of all the fine polymerics tested.*

Today, Plastolein 9720 is still the lowest cost polymeric plasticizer, and is still being used by this and many other manufacturers in such heavy-duty goods. Why not check 9720 yourself? Write Dept. F-6 for literature and sample.

PLASTOLEIN® plasticizers

 **Emery** Industries, Inc.

Organic Chemical Sales Department

Carew Tower, Cincinnati 2, O. • Vopcolene Div., Los Angeles
Emery Industries (Canada), London, Ontario—Export Department, Cincinnati



Boom ahead for styrene foam

Major breakthroughs

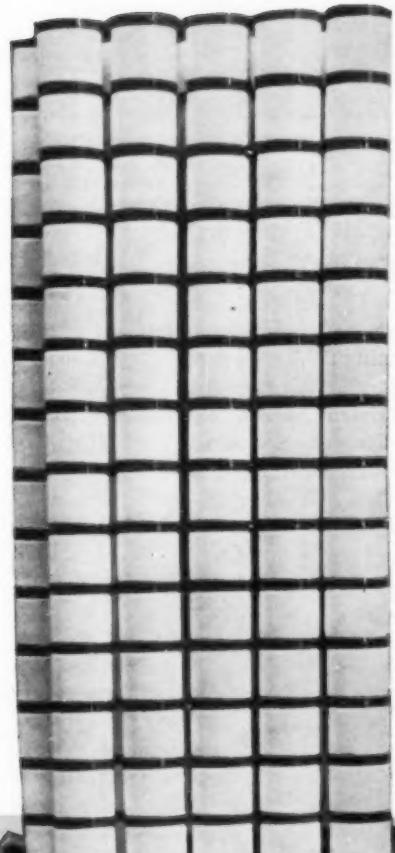
are expected in expandable styrene beads.

Here's what you must know

about materials, processes, markets,

and economics to engage

in this growing industry



It now looks as if expandable polystyrene foam may turn out to be the next big breakthrough in plastics.

From a few pioneers in 1955, this segment of the industry has grown to over 100 custom molders to date. Within the next few years, that number is expected to double; and, what's even more important, captive operations established by large-volume users are almost sure to contribute further—and heavily—to the rapid expansion movement.

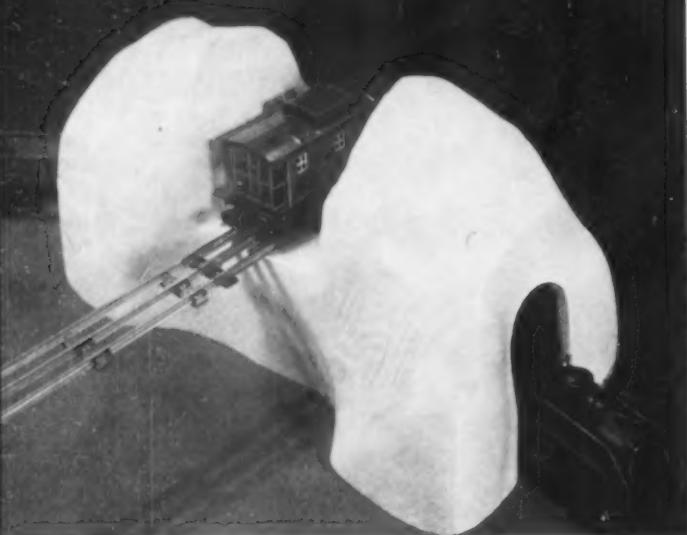
The markets? Packaging, displays, flotation, appliances, insulation, toys, building construction, and furniture—to mention only some of the existing volume applications.

Success for any molder will depend on efficient processing, economical mold design, reli-

Photos, Sheffield Plastics Inc.



BIG LIFT for polystyrene foam in the container field is the introduction of threaded 4-oz. jars for cosmetic creams. Model at left can effortlessly support 280 jars, which stack easily and weigh less than $\frac{1}{2}$ oz. each—one-tenth as much as opal glass. The smooth polished containers (see close-up above) also cost 20% less and are virtually unbreakable.



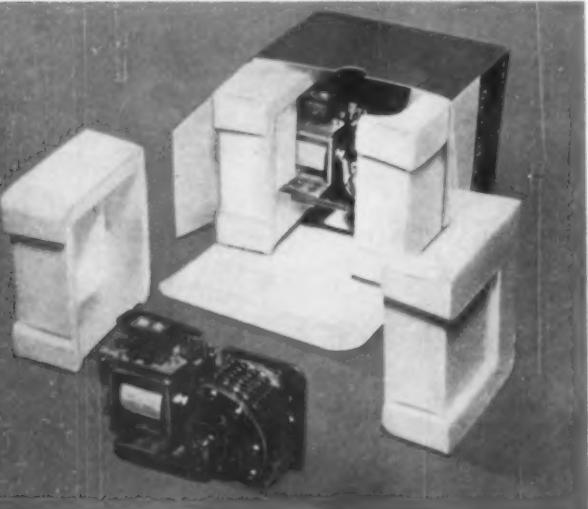
TUNNEL for use in hobby railroad layout molded by Life-Like Products shows potential of foam in the toy field. The material can also be colored and complete scenic panoramas can be molded.

Photo, Koppers Co. Inc.



COMPLEX CONTOURS of fragile items are securely cradled in molded package for A. C. Gilbert Co. microscope sets. Clean foam also adds to the sales appeal.

Photo, C. P. Clare & Co.



MOLDED END CAPS protect delicate telephone relays during shipment better than cardboard, while reducing cubage and weight.

able service, and selecting the right market. Without these, he might find it difficult to survive in a business climate that's going to be highly competitive.

What are the materials?

Expandable polystyrene is produced as free-flowing beads containing a hydrocarbon propellant which causes them to expand when subjected to heat. This process changes bulk density from approximately 38 lb./cu. ft. to the lowest commercial density of about 1 lb./cu. ft. At this last density the foam, while still retaining

body, is lighter than cleansing tissue. The beads are supplied in various sizes, in regular and self-extinguishing grades, by Koppers Co., Pittsburgh, Pa. (Dylite); The Dow Chemical Co., Midland, Mich. (Pelaspan); and United Cork Companies, Kearny, N. J. (Uni-Crest).

Foaming consists mainly of two steps: 1) pre-expansion of the virgin beads; and 2) further expansion of the pre-expanded beads within the shaping confines of a mold. Beads can be charged directly into the mold and expanded. But pre-expansion is necessary where uniform or low densities (3 lb./cu. ft. and below) in the finished article are desired. Pre-expansion can be accomplished by steam, radiant or oven heat, or hot water.

Foams from expandable polystyrene have a closed-cell structure, controllable density, low thermal conductivity (a K factor of around 0.24 at the average commercial density at 75° F.), low water absorption, low water vapor permeability, tensile strength of around 30 p.s.i., and compressive strength of 14 p.s.i. at the 1 lb./cu. ft. density. They resist acids and alkalies and do not embrittle at sub-zero temperatures. The foam is essentially rigid, although several companies, including Plastifoam Corp., Rockville, Conn.; Gilman Brothers Co., Gilman, Conn.; General Foam Plastics Corp., Portsmouth, Va.; and more recently, Armstrong Cork Co., Lancaster, Pa., have produced flexi-

ble varieties. The natural color of expanded beads is white, but they can be dry colored or solution dyed before pre-expansion, resulting in pastel colored molded articles. Deeper colors have not yet been produced successfully on a commercial scale.

The truck load price of beads is 37¢/lb. for the standard grade, and 45¢/lb. for the self-extinguishing grades.

How beads are pre-expanded

One of the most successful methods of pre-expansion utilizes the Rodman steam pre-expander. This unit was developed by Koppers¹ and is available from The Rainville Co. Inc., Garden City, N. Y., and Artisan Metal Products Co., Waltham, Mass. The machine may be adjusted for producing pre-expanded beads with densities between 1 and 20 lb./cu. ft. One model, with a 200-gal. tank, and operating continuously, can pre-expand 300-lb.-per-hour at the 1-lb. density. A new steam pre-expander, developed by another machine manufacturer, reportedly results in equal expansion of each bead and is said to permit a density control of one ounce by volume.

Radiant (infra-red) heat expansion utilizes an endless conveyor belt which passes a layer

¹ U.S. Pat. applied for.

of raw beads under a bank of electric heating elements. The slower the belt speed, the lower the density of the product. Limitations of this process are low production rates; a minimum pre-expanded bulk density of 2 lb./cu. ft.; and some fire hazard. Radiant heat pre-expanders are manufactured by F. F. Slocomb Corp., Wilmington, Del., and sold by Rainville.

Hot water and oven pre-expansion are mainly suitable for laboratory applications. In the first, beads are submerged in boiling water and kept slurred by a stirring device; in oven pre-expansion beads are sprinkled on a tray which is then placed in an oven at approximately 275° F.

Prior to molding the pre-expanded beads are generally "aged" or stored to permit stabilization of air pressure within the bead cells. The length of storing time varies inversely with the density and amounts to between 4 and 48 hr. for a 1 lb./cu. ft. density. At least one machine manufacturer hopes to eliminate this step in the production cycle.

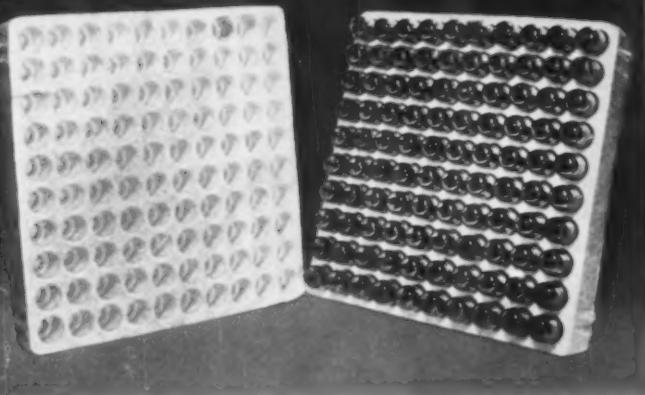
About molds and molding

Very large molds, such as those for planks, can be filled by gravity. Single or multicavity molds can be sweep-fed in some instances. But in most operations, blow filling—conveying the material into a mold cavity by the use of com-

Photo, Electro-Voice Inc.

HI-FI LOUDSPEAKER CONES, 30 in. in diameter, are fastened on production line. Paper cones lack the rigidity of polystyrene foam, and other rigid materials are too heavy.





COMBINATIONS of matching trays in two basic heights are used interchangeably by RCA to ship miniature receiving tubes with overall lengths from 1 3/4 to 3 1/16 inch. Sulliffoam Inc. molded the 10 1/2 in. square trays which hold 100 tubes.



KEEPING MILK HOT for hours and protecting glass against breakage is easy with lightweight container molded by L. M. Plastics Co.

COLD WATER LINES at Idlewild Airport, New York, N. Y., are insulated with foam covering molded by Mundet Cork Corp. While one workman applies asphalt emulsion to inside cover for tighter fit, other workman (at rear) ties steel band to hold foam.



Photo, Koppers Co. Inc.

pressed air—is preferred. It results in more uniform part density; faster filling; elimination of "flash" since the mold is filled in the closed position; reduces waste; and permits greater flexibility in part and mold design. Adjustable blow guns, designed specifically for filling operations, are supplied by Goulding Mfg. Co., Saginaw, Mich., and Rainville.

The most common form of mold is a cast aluminum die surrounded by a steam chest. The steam heats the mold and furnishes steam to the mold cavity through small holes or core box vents. Cooling water is circulated or sprayed to provide maximum cooling of the mold and the molded part. Molds can be made by any competent foundry, but the mold design requires an understanding of the special problems of working with expandable polystyrene, especially even steam distribution.

Mold costs vary considerably. Springfield Cast Products Inc., Springfield, Mass., a company that has much experience in mold construction for expandable polystyrene, has made sample molds from \$150 to \$900 each, and production molds costing from \$1000 to \$11,000. The cost of the average production mold is in the range of \$1500 to \$3500. These molds incorporate automatic or hand feed; Teflon coated cavities; spray cooling on the outside of the cavities; provisions for steam and drains. They can be produced with practically any number of cavities.

What's the machinery picture?

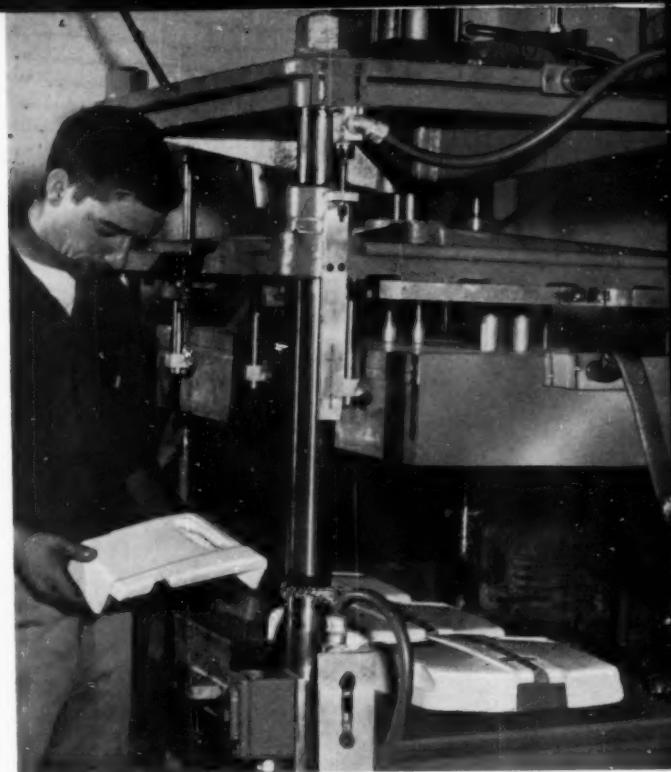
Many producers have adapted all types of presses for molding beads, since no compression is required and platen presses operated by air or hydraulic cylinders, or self-clamping molds are frequently sufficient to resist the pressures exerted by the steam and the expanding polystyrene. However, several companies are making efforts to develop more efficient machinery and to provide varying degrees of automation. The growing interest in expandable polystyrene has created so much activity on the part of machinery manufacturers, that obsolescence of equipment is an important consideration in estimating production costs. Many people in the industry feel that equipment should be depreciated over a period of four years or less. Only an extremely versatile machine is likely to give efficient service beyond that period.

A typical vertical hydraulic press manufactured by Springfield Cast Products Inc., with a 28-ton capacity, a 42- by 42-in. opening between guide posts, and a maximum press open-

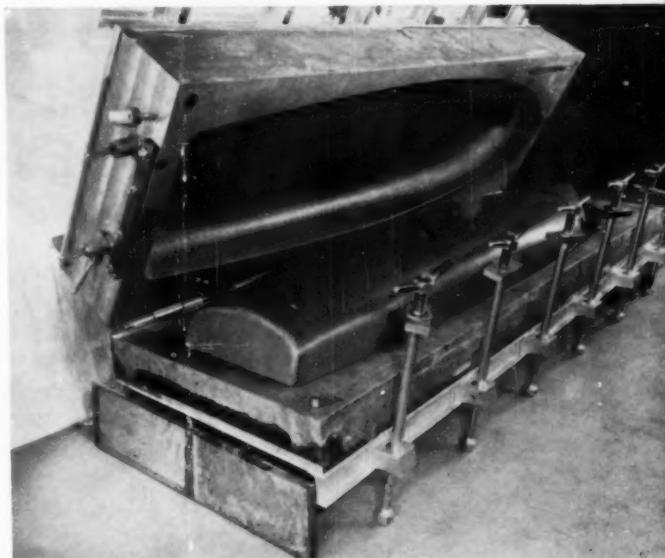
ing of 46 in. with a 40-in. stroke costs \$6000. It automatically controls closing, loading, steaming, cooling, and draining. The company is now constructing a horizontal press which incorporates automatic feeding and ejection. The cost for this machine has not yet been established. Tronomic Machine Mfg. Corp., New York, N. Y., supplies a range of presses from 40 to 100 tons, designed for a minimum internal molding pressure of 35 p.s.i. The fully automatic machines are actuated by compressed air. One special feature is 40 in. of daylight on a 16-in. stroke. Completely automatic units ranging from 24- by 36-in. platen area, up to 49 by 73 in., cost from \$9000 to \$12,000. The press itself, without the automation features, costs about \$6000.

Complete automation from pre-expanding the beads to ejecting the finished molded parts at a rate approximating injection molding cycles has not yet been achieved, but should be expected soon. Without it, markets that are already "sold" on the material but not on the processing—primarily the packaging and container field—may not be fully realized. Along these lines, one company is building a machine which is designed for volume production. A prototype has been in operation for more than a year and a further refined version should be on the market within a short time. This machine does not have platens, but "grids" 48 in. high and 60 in. wide, on which the molds are mounted. Widths of molds can be designed in 3-in. increments and vertical dimensions in 1-in. increments. It employs a dual steam pressure system—60 p.s.i.—for quick preheating of the molds, resulting in a better surface gloss of the finished product; and 20 to 35 p.s.i. for fusing the beads. According to the company, storage of pre-expanded beads is eliminated; loading of molds is automatic; condensation is virtually eliminated; removal of parts is simplified; and all stages of the operating cycle are reportedly speeded up. Another advantage claimed for this machine is that different products can be run simultaneously since all molds have the same height between mounting surfaces in the closed position, and each mold is loaded separately. This would permit, for example, the simultaneous molding of five different-size flower pots in different colors at a rate of about 40 pots a minute. The complete unit costs about \$36,000.

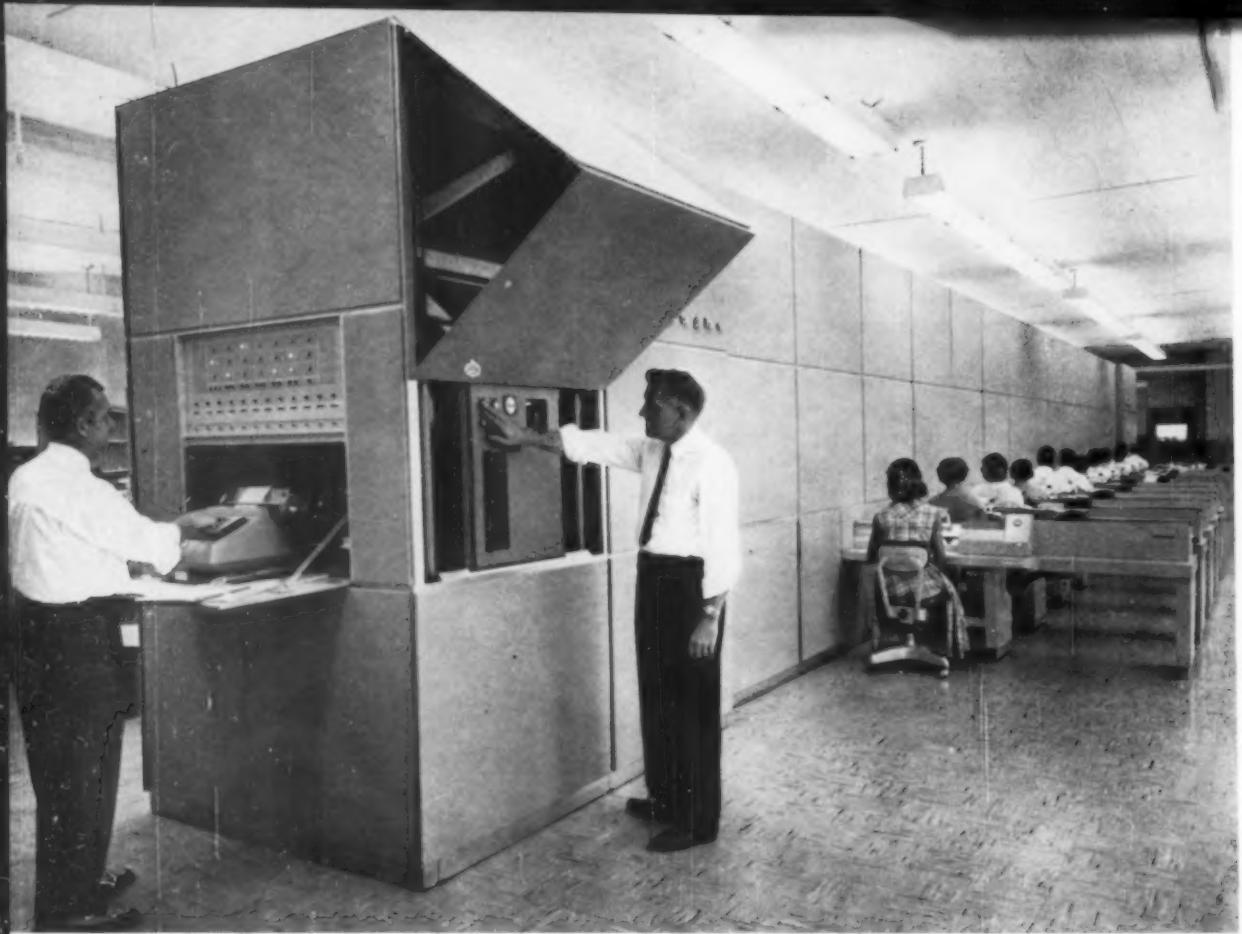
The introduction of high-speed equipment naturally involves a larger initial capital outlay and requires volume customers. (To page 186)



SIX-CAVITY pressure cast aluminum mold mounted on 12.5-ton Springfield Cycle-Matic press in open position. Mold is filled automatically by venturi (center right). Machine is making end packs for Royal McBee portable typewriter on a 1.75-min. molding cycle.



SELF-CONTAINED pressure cast aluminum mold for Sea Snark boat, which measures 11 ft. long, 3 ft. wide, and 12 in. deep, includes a reinforcing I-beam on both top and bottom. This 5000-lb. mold has provisions for blowing beads into the mold and for steam, drain, and spray cooling in mold chest; venting in the female half for admission of steam into the cavity; and hinge and locking device, as well as a permanent parting agent that is bonded to the cavity surfaces of the mold.



ENTIRE EXTERIOR of mail sorter is enclosed by plywood sandwich panels surfaced with vinyl-clad steel. Supervisor (right) regulates speed of machine.

POST OFFICE MODERNIZES—

DESTINATION BINS (279 in all) along back of letter sorter incorporate molded high-impact styrene bottoms. Ribbed construction (close-up at right) facilitates letter removal. Doors are fabricated from $\frac{1}{8}$ -in. acrylic sheet stock.



Hundreds of pounds of plastics, involving several types of materials, contribute to the manufacturing economy, operating efficiency, and styling of the world's largest-capacity letter sorting machine, recently installed in the Detroit, Mich. Roosevelt Park Annex Post Office. Designed and built by Burroughs Corp. in cooperation with the United States Post Office Department, the sorter incorporates the latest advances in office handling equipment. As such it may be expected to become a repository of ideas for advanced office machine designs, suggesting to other companies ways of updating their equipment through the use of a variety of plastics.

More than doubling the capacity of any existing letter sorting machine, the Burroughs unit measures 78 ft. long, 12 ft. wide (including the operator consoles) and 10 ft. high. With all 12 consoles in operation, the semi-automatic machine is capable of sorting 43,000 letters per hour to 279 destinations. Under present plans, a battery of 30 such machines will be installed in Detroit's new \$23 million post office, which is

scheduled for completion late this year. Other major post offices throughout the country are expected to follow suit in the near future.

How it works

Major components of the sorter include the operator control stations, or consoles; encoding and decoding units; a recirculating conveyor system, and sorter bins, as well as a supervisor's control station.

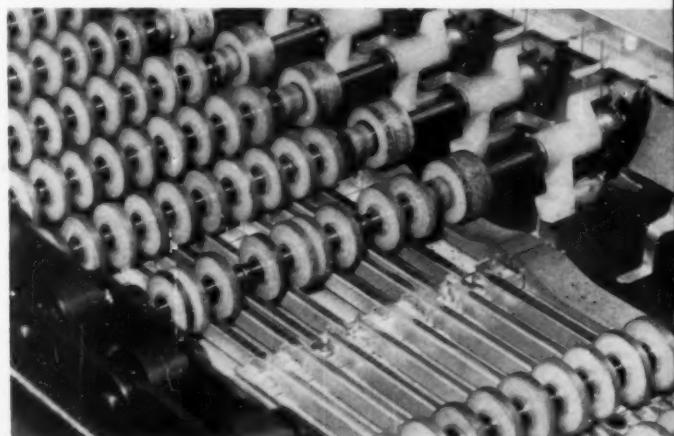
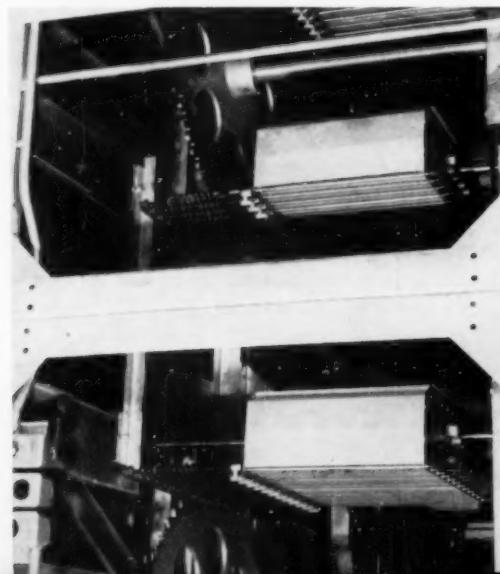
As intermixed letters are moved automatically in front of each operator, he presses several keys, arranging a series of code wheels so that, when the letters pass over a complementing code pattern at the destination bins, they are automatically released from 12-compartment letter carts into the appropriate sorter bin. Code wheels then pass through an ingenious decoding unit, and the process is repeated.

The design of the sorter, according to Burroughs, "involved the use of any material that would result in a top quality product consistent with reasonable manufacturing costs." On this basis, the principal plastics chosen for incorpo-

**Semi-automatic letter sorter that brings new efficiency to mail operations
relies on vinyl, styrene, acrylic, and nylon for function and appearance**

WITH PLASTICS

INTERNAL VIEW (left) of end of the sorter shows the 12-pocket letter carts, which carry the letters to coded destination bins. Also visible are the link chains with nylon rollers, which convey the carts through the machine. Nylon code wheels which cause letters to be sorted into proper bins are shown at right. Machine has 20,000 such wheels.





OPERATOR CONSOLES, which are shown in over-all photo on p. 92. Open view (right) illustrates use of nylon rollers and related parts on belts, which feed letters in toward operator, to be picked up singly by vacuum head. Detroit unit has 12 consoles.

ration in the machine include vinyl chloride sheeting (bonded to steel panels), methacrylate, nylon, impact styrene, cellulose acetate butyrate, and phenolic.

Vinyl-clad housing

The complete exterior housing or "skin" of the sorter consists of vinyl-clad steel laminated to a $\frac{3}{8}$ -in. plywood backing by Haskelite Mfg. Corp., Grand Rapids, Mich. Haskelite also fabricates the panels to finished dimensions, ready to be mounted to the basic steel structure of the sorter. The vinyl-clad steel material is produced by U. S. Steel Corp. Burroughs engineers estimate that approximately 1100 sq. ft. of it is used in the equipment.

Appearance design of the mail sorter was by Lawrence H. Wilson Associates, Detroit, consultant designers to Burroughs Corp.

As compared to a painted surface, the vinyl exterior skin assures uniform color and texture in the panels. It also eliminates the hazard of "orange peel," which would be present in a painted surface of this area. Scuff resistance and washability of the protective vinyl coating means lifetime ease of maintenance.

Also of interest to Burroughs engineers and the design organization were the saving in weight, as compared to solid metal panels of heavier gage, and the outstanding sound-con-

taining properties of the vinyl-steel-plywood combination, making for reduced operating fatigue and greater personnel efficiency.

Functionally, the outstanding applications of plastics in the mail sorter consist of injection molded and fabricated nylon components. Some 20,000 code wheels, slightly less than 1 in. in diameter, represent approximately 163 pounds of nylon. These parts were fabricated from nylon rod stock in Burroughs' Detroit plant. In addition to the code wheels, support wheels, trip dogs, outrigger wheels, and turn guidance wheels of the letter carts were specified in nylon for good bearing and strength properties and reduced noise. Some of these items are fabricated; others, injection molded. Also of nylon are the rollers used in the chain drive mechanism which transports the 161 letter carts. Diamond Chain Co. supplies this component, which combines nylon rollers and metal links. Nyliner (nylon) bearings are also used in several high volume assemblies.

Including such miscellaneous applications as AMP multiple pin connectors, stop nuts with nylon inserts, and Nylock set screws having inserts of the same material, the total poundage of nylon in the Burroughs letter sorter is estimated in excess of 350 pounds.

Extensive use of Plexiglas cast acrylic sheet stock in the mail sorter (To page 194)

MODEL IS HOLDING dinner plate drawer, which shows how design permits accommodation of many shapes and sizes. Note tiered design of indentation of glassware tray that allows various-sized glasses to be readily nested.

"Custom" drawer mass-produced

Formed polystyrene storage units, specifically designed for particular uses, may help break a long standing bottleneck of plastics in furniture

An important new dimension has been added to the plastic furniture drawer market with the introduction by Richardson Bros. Co., Sheboygan, Wis., of contoured polystyrene tray-drawers in several of its buffets.

Until now, plastic drawers were by and large pretty close duplicates of conventional wooden drawers: rectangular boxes open at the top.

The new drawer, on the other hand, by taking advantage of the economies of thermo-forming, is produced with contoured indentations to accommodate different kinds of eating utensils. Three models have been produced. One holds plates of any shape and size, the second nests crystal and glasses, and the third stores silverware. Not only do the drawers store these items neatly but also they can be easily taken out of the buffet and carried over to the table to facilitate setting.

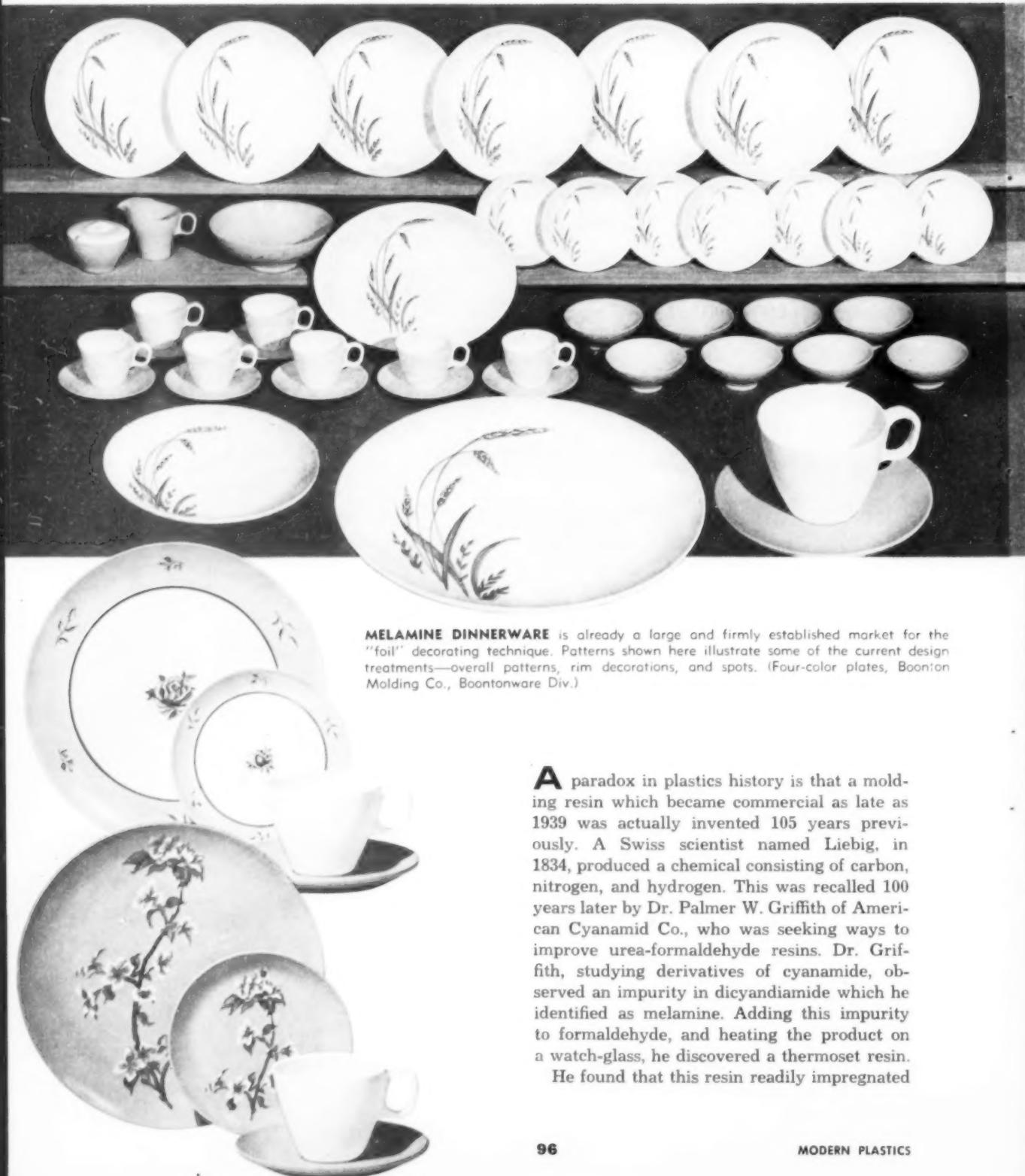
It appears likely that an extension of this principle might lead to similarly constructed drawers for linens, shirts, lingerie, and other textile items.

The trays are formed by Robert A. Schless & Co. Inc., Elizabethtown, N. Y. (To page 196)



SILVERWARE TRAY holds large selection of utensils. Trays are portable and of pleasing appearance so that they can be brought to table.

Plastics in the product revolution:



MELAMINE DINNERWARE is already a large and firmly established market for the "foil" decorating technique. Patterns shown here illustrate some of the current design treatments—overall patterns, rim decorations, and spots. (Four-color plates, Boonton Molding Co., Boontonware Div.)

A paradox in plastics history is that a molding resin which became commercial as late as 1939 was actually invented 105 years previously. A Swiss scientist named Liebig, in 1834, produced a chemical consisting of carbon, nitrogen, and hydrogen. This was recalled 100 years later by Dr. Palmer W. Griffith of American Cyanamid Co., who was seeking ways to improve urea-formaldehyde resins. Dr. Griffith, studying derivatives of cyanamide, observed an impurity in dicyandiamide which he identified as melamine. Adding this impurity to formaldehyde, and heating the product on a watch-glass, he discovered a thermoset resin. He found that this resin readily impregnated

DECORATED THERMOSETS

Major breakthroughs in decorative foil extend market from melamine to urea and phenolics, from flat dinnerware to cups, and to deep-draw and compound-curved industrial parts

cellulosic material, including paper; and, after studying the remarkable heat, light, and abrasion-resistance of such composite materials, Dr. Griffith came to the conclusion that the new resin could supplant thiourea as an overlay material for the new decorative high-pressure laminates then being introduced. Accordingly, he introduced the resin to George Clark, who was then Research Director of the Formica Co., and a revolution in the decorative laminate field was begun.

And then, molding compounds

Now, reckoned Dr. Griffith, if this resin could so successfully impregnate cellulosics, perhaps it could be mixed with cellulosic pulp, dried, ground up, and made into a molding powder. This he did in 1938. The molding material was introduced in 1939, in time to be of

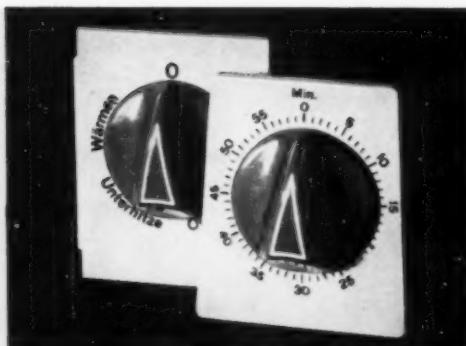


THE COVER: Foil-decorating technique has progressed from dinnerware (top) to wide range of products (bottom row). Foil shown in center by Commercial Decal, decorated plate (right) by Plastics Mfg. Co., products in bottom row by Ornapress A. G.



NAMEPLATES and escutcheons represent promising market for decorating technique: lettering and legends are molded in, cannot come off.

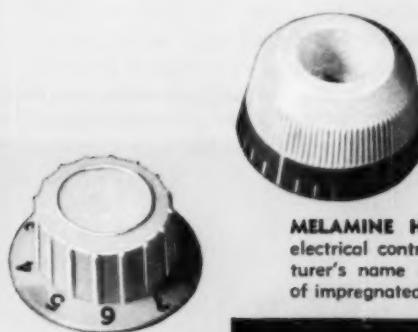
Illustrations, Ornapress A. G.



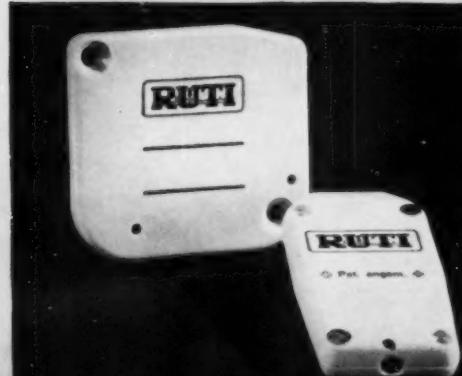
COMBINATION dial plates and knobs (above) take advantage of versatility of decorating medium. Industrial applications such as these are expected to become a major market for this method.

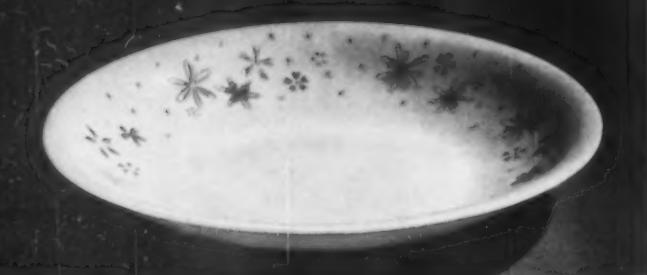


KNOBS are an attractive application for this technique. Since foil can be decorated in many colors, various codes can be molded-in without complicated spray painting procedures.



MELAMINE HOUSINGS (below) for electrical control unit have manufacturer's name molded-in through use of impregnated foil decorating system.





DEPTH OF DRAW possible with decorative foil is illustrated by this soup plate. From rim to inside bottom of plate is approximately 1 1/8 inches. Pattern is molded-in without distortion.

great service in electromotive components during World War II. For this achievement Dr. Griffith won the John Wesley Hyatt Award.

Some of the first melamine parts molded were magneto and aircraft ignition parts for Bendix Aviation Corp. A particularly tough job, because it had to be mineral-filled, was an ignition harness component for the Merlin Rolls Royce engine made by Packard Motor Co. for the molded plywood Mosquito bomber, the scourge of Hitler's air force in Norway.

The exceptional dielectric strength of the material, its dimensional stability, its heat and arc resistance, established it as a utilitarian material of great peacetime potential.

Early in the Second World War, the Navy equipped one of its ships with melamine dinnerware. After the war, experiments continued. Later, the Quartermaster Corps became

interested in the general use of the dinnerware for the Armed Forces. Thereby began still another revolution.

Commercial dinnerware is next

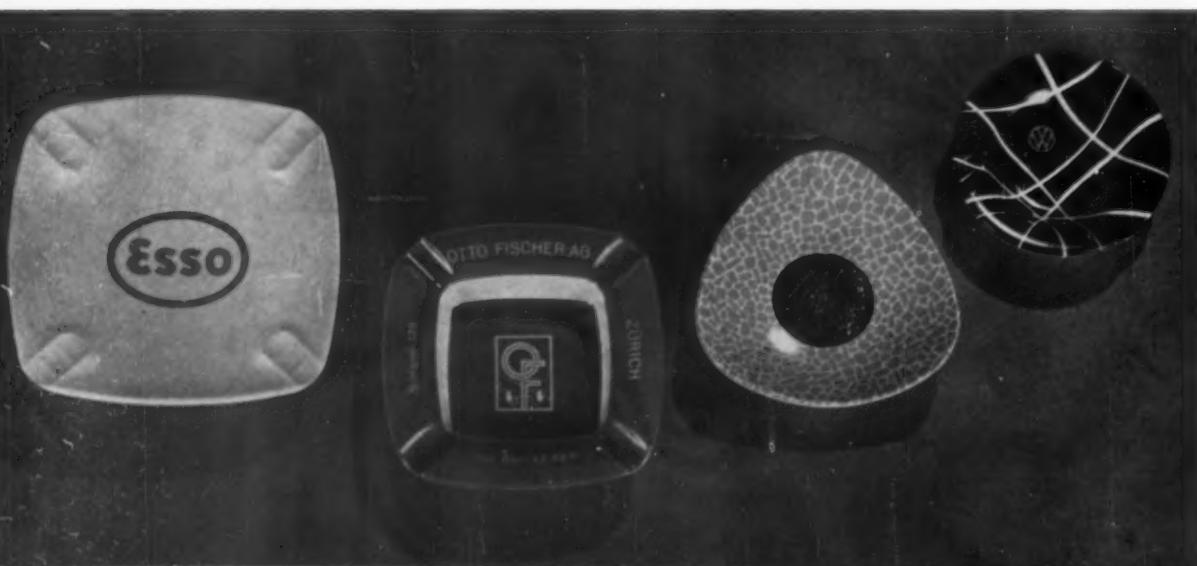
Believing that in tableware, as in electro-motive applications, melamine molding material might have a considerable peacetime future, and having by this time learned how to properly color melamine molding powder to the same delicate shades long since available in urea, American Cyanamid Co., in 1945, commissioned famed designer Russell Wright to style a line of dinnerware for hospitals, school cafeterias, and restaurants.

The first moldings were run at American Cyanamid's laboratories, Bound Brook, N. J., and test installations were made in nine locations across the country. There were many problems. Such matters as shape, flash point, finish, and production variables were studied by the laboratory and a team from Newark Die Co., who made original molds. Ease of stacking, shape of vessel, thickness and diameter of product were studied in the field. Market Research Corp. of America was called in to analyze potential consumer markets in both hard and soft water areas where both service and cleaning treatment would be most severe.

Several custom molders then opened proprietary molding divisions to make and market plain colored melamine dinnerware to the mass-feeding outlets, thereby establishing a whole new industry.

The early battles between this newcomer to the tableware market and the entrenched in-

ASH TRAYS run the gamut of design potential—spot, rim and bottom, and overall pattern. Molded of decorated melamine, they provide the institutional user with a highly effective product.





Photos, Ornapress A. G.

DAISY DESIGN ON PLATE AND SAUCER is repeated on side of cup and coffee decanter. These side decorations are not decals, but are actually molded-in, just as those on the plates.

terests in china and crockery were many and had to be thwarted by expensive, but successful, research programs proving that melamine tableware was safe to use and, indeed, healthier than the materials with which it competes.

Under the auspices of the Melamine Tableware Div. of S.P.I., booklets were prepared for distribution to home economists and managers of mass-feeding establishments. Factual advertisements and articles on the use and care of melamine tableware were placed in consumer and trade publications, first by American Cyanamid and later by some molders. Molders were encouraged to use informative labeling, carrying these same facts. Indeed, American Cyanamid won awards for its informative labels, tags, and brochures.

Merchandising, advertising, publicity, and labeling were not enough. Twelve molders were in the business by 1948, and sales had quadrupled each year since the introduction of the idea in 1945. But there were no standards. Someone could always make a plate thinner, make it faster and give less care to finish in the hope of making a bigger profit. So, again, through the Melamine Tableware Div. of S.P.I., commercial and household standards were developed in cooperation with the U. S. Bureau of Standards, and the end-user was thereby assured of quality.

Family formations in the period 1947 to 1955 were at an all time high, and the new brides took to melamine tableware readily. As more

restaurants and cafeterias discovered the economic values and savings inherent to the new ware, the word was spread and sales continued to climb. Department store buyers, faced with the inevitable, learned to display it in competition with their standard dinnerware lines and to use the informative labeling, which was the key to the marketing program. There was still something lacking—another breakthrough was required: decoration.

Discovering the decorating technique

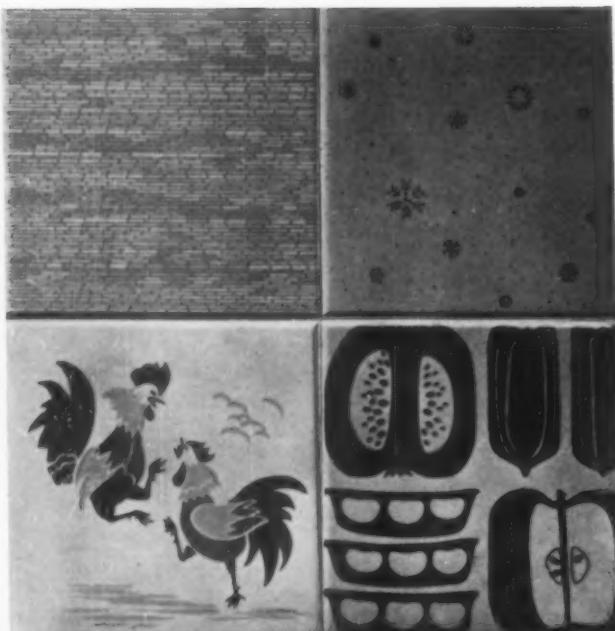
Literally, everything from decalcomania to hand painting was tried. Various textiles and papers were experimented with as overlays. Nothing worked well until 1953, when another Swiss gentleman, Gustav Hessel, came up with several kinds of "foils" printed with compatible melamine inks which would be molded into plates and saucers. First he tried it with printed textiles, but these were expensive and difficult to handle; then came alpha-cellulose papers, and finally an all-rayon paper.

In May 1954, while American Cyanamid's Bound Brook laboratory was working on the development of techniques suitable for mass production of decorated melamine dinnerware by the foil method, the company's Stamford lab came through with a special catalyst which greatly advanced the proposition. At Bound Brook the first rayon paper foils were used.

Mr. Hessel was one of the founders of the firm, Ornapress A.G., Zurich, Switzerland,



CLOCK AND DIAL FACES, molded of melamine with molded-in decorative foil, can be made in any color combination in one operation, require no decorative after treatment.



pioneers of the process, which now has 39 licensees throughout the world.

There was then established a basis of co-operation between Ornapress and Fairhaven Properties Corp. of New York, which introduced the decorating process to the United States and which hold the Fairey Aviation patents, covering a process of handling printed and impregnated foil in the actual molding of tableware and other decorative items in both melamine and urea. Due to this cooperation, several printing organizations were licensed to produce the foils for the molders. This was the breakthrough needed to allow tableware designers to create a product that would compete directly with the finest china.

In the molding process, the foil literally disappeared, leaving the design in multi-color brilliance. Within months after its introduction to the U.S., there were a score of beautiful patterns available, and hotels and restaurants had their crests molded into services.

Back in 1942, Plaskon Div., Libbey-Owens-Ford Glass Co., now the Plastics and Coal Chemicals Div. of Allied Chemical Corp., was licensed to manufacture melamine molding powder, giving the industry two sources of material and adding the emphasis and persuasiveness of more promotional money. The result of all this—business boomed. By 1955 there were 16 molders making melamine dinnerware. In 1960 there are 24. And now, additional molders are coming in, recognizing value of the decorative process for industrial moldings—such as knobs, dials, etc.

Between 1955 and 1960, thanks to the so-called flat "foils," sales of decorated melamine tableware increased to the point where in 1959 70% of the tableware sold was so decorated. But there was still a stymie. Yet another breakthrough was required. The "foils" were moldable only on flat or gently-curved surfaces. Ornapress research and development was directed during this period toward the production of deep-draw "foils" which could be molded into cups, vases, and pitchers. In 1957, Chicago Molded Products Corp., with "foils" produced by Commercial Decal Inc., successfully molded the Schlitztap, a beer tap handle for the Joseph Schlitz Brewing Co., making

FOUR TILES AT LEFT are molded of phenolic with molded-in decorative foil. Tile at top is molded of melamine, decorated with a foil printed with a half tone of a photograph.



Photos, Ornapress A. G.



VERSATILITY OF TECHNIQUE is illustrated by plates above. Stack at left shows half-tone reproduction with sharp cutoff edges. Above are shown a variety of different patterns and sharp draws.

this the first application of the "foil" decorative technique to a compound-curved surface and the first production use of the "foils" outside of the dinnerware field. In the same year, Plastics Mfg. Co., Dallas, Texas, molded tableware with two different colors inside and outside by a process still a secret. In 1958, Kaumagraph Co. developed the first brilliant non-offsetting gold which compared favorably with a ceramic over-glaze.

And now—the industrial market

Why the emphasis on research into decorative "foils" which would mold into compound-curved shapes? Simply because first, tableware molders and the chinaware people coming into the melamine market wanted to decorate complex shapes and, second, a considerable market was envisioned in three-dimensional decorated molding of knobs, dials, escutcheons, and signs. Beyond all this, research was being conducted on the manufacture of a melamine-surfaced filled phenolic wall tile which would have molded-in multi-color decoration and should compete satisfactorily with the finest hand-made ceramic tile.

In the case of the knobs, dials, and handles for appliances, urea material (5 million lb. annually) has historically been molded and then decorated by hand wipe-on or roll leaf methods. The "foils" could be adapted to urea as well as to melamine if they could be made to take deep-draw. Indeed, some closure molders envisioned phenolic closure bases with decorated melamine surfaces. In the case of the wall tile, there is a known market of over 400 million sq. ft. per year for bathrooms only and, if melamine-surfaced tile would be accepted, it could count on at least 10% of that market or 40 million sq. ft. in a very short time.

The final breakthrough came in March 1960, when Ornapress successfully molded deep-draw ash trays, pitchers, cups, beer mugs,

knobs, dials and a host of other products with a new form of drawable "foil." They then went even further. They reproduced, in "foils," full-color photographs which could be molded into souvenir items, and they discovered a low-cost method of reproducing black and white photographs to be molded into enduring plaques.

There is a considerable difference between present American and European methods of producing the rayon paper foils. First, in the U.S., ordinary methods of resin impregnation, such as by roll, are used; in Europe, impregnation is by vacuum process which, it is claimed, puts more of the resin in the structure of the foil, between and around the fibers. Second, in the U.S., printing is done after resin impregnation, which limits the full use of a wide range of color; in Europe the printing is done first and impregnation follows, which is claimed to provide flexibility in the process.

So, over the course of 126 years, the last 26 of them witnessing five technical revolutions, melamine becomes a material of hitherto undreamed of utility and beauty. In 1959, between 55 and 60 million lb. of melamine molding powder were consumed in the United States, and conservative authorities predict sales of 100 million lb. per annum within the next three years. In addition, urea markets are likely to be enhanced by the same factors.

Currently, blue chip processors are moving to take the next logical step: fully automatic molding of "foil"-decorated tableware in all shapes. The development of this equipment will not be inexpensive, but human error will be eliminated and rejects cut practically to zero, thereby building more sales and profits.

Over 300 stores surveyed at the end of 1959 reported that decorated melamine tableware represented 71.8% of their sales and predicted that in 1960 this will rise to more than 75 percent. They also predict a sales increase of 22.2% in 1960 over 1959.—End

For precision spray painting:



REAR END of Chevrolet pick-up truck, already painted with one color. Tape has been stripped along sides to produce sharp paint break.



SPRAY PAINT SHIELDS are positioned preparatory to application of second color. Permanent magnets, visible along lower edges of shields, hold masks in place. Molded-in handles facilitate work.



PAINT JOB IS COMPLETE and shields have been removed from truck. Removal of tape completes operation.



STRIPS OF GLASS CLOTH are laid up on "mold" and formed into a laminate, using tooling resin. One advantage of this construction is that damage, should it occur, can be easily repaired.

← **MOLD FOR SHIELD** is actual part on which it will be used, in this case a rear fender. Before laminate is laid up, part is thoroughly cleaned and then waxed for better mold release.

RP shields

Two-tone truck bodies are finished with greater efficiency through use of "magnetized" molded reinforced plastics "stencil." Technique is directly applicable to the mass-production decoration of other compound-curved products

Impressive production economies have been realized by one of the big three automakers through the development of a reinforced epoxy spray paint shield. The new device, in effect a plastic stencil, permits faster work and more extensive and complicated color and paint combination on mass-produced items, in this case truck bodies, than was heretofore possible. While first usage is in the automotive field, the same system can be readily applied in any number of other industries.

Developed by Chevrolet-Janesville, Janesville, Wis., and built with epoxy tooling material compounded by Ren Plastics Inc., Lansing, Mich., the shield replaces the time-consuming paper and masking tape method for blocking out areas for color and design combinations.

In addition to the time savings, the reinforced epoxy paint shields also make possible extensive savings in materials. During 1959, Chevrolet-Janesville, by using the new plastic shields, saved a total of 139,760 ft. of 18-in. wide kraft paper, 18,900 ft. of 30-in. kraft paper, and 244,760 ft. of 1½-in. masking tape.

How it is done

The shield is built as a lamination of resin and glass cloth by hand lay-up. For a mold, the actual part on which it will be applied is used.

Thus, the finished shield will follow all contours precisely and fit snugly. Flat, curved, or rounded surfaces present no particular problem, because the shield is designed and built to meet these conditions.

As the shield is being laid up, permanent magnets are inserted at given intervals around the perimeter of the unit and become molded in as additional cloth and resin is laid up. Thus, when the finished shield is positioned on the work, it holds itself in place. And to facilitate efficient usage, handles are also molded in during the lamination process. Cure is achieved at room temperature and takes approximately 24 to 48 hours.

Basic suppliers of the resins used by Ren Plastics in compounding operations for the epoxy materials include Ciba Products Corp., Fair Lawn, N. J., and Union Carbide Plastics Co., New York, N. Y. Safety hardeners used are derived from aliphatic polyamines.

The parting compound technique, used in standard tooling, is also used with the shields to make cleaning easy. Parting agents applied to the shield make it possible to strip off paint build-up quickly and easily.

The step-by-step procedures used in this technique are illustrated in the accompanying photographs.—End



PERMANENT MAGNET is molded into lamination through liberal application of resin, acts to hold shield in position during paint application.



FINISHED SHIELD is lifted off mold. Note molded-in handles. Flash along edges has been removed.

VINYL FABRICS IN A BIG WAY

**Pioneer of the mass-produced car
applies engineering know-how to establish
automated and integrated plant
for production of high quality vinyl-coated
upholstery fabrics at competitive prices**

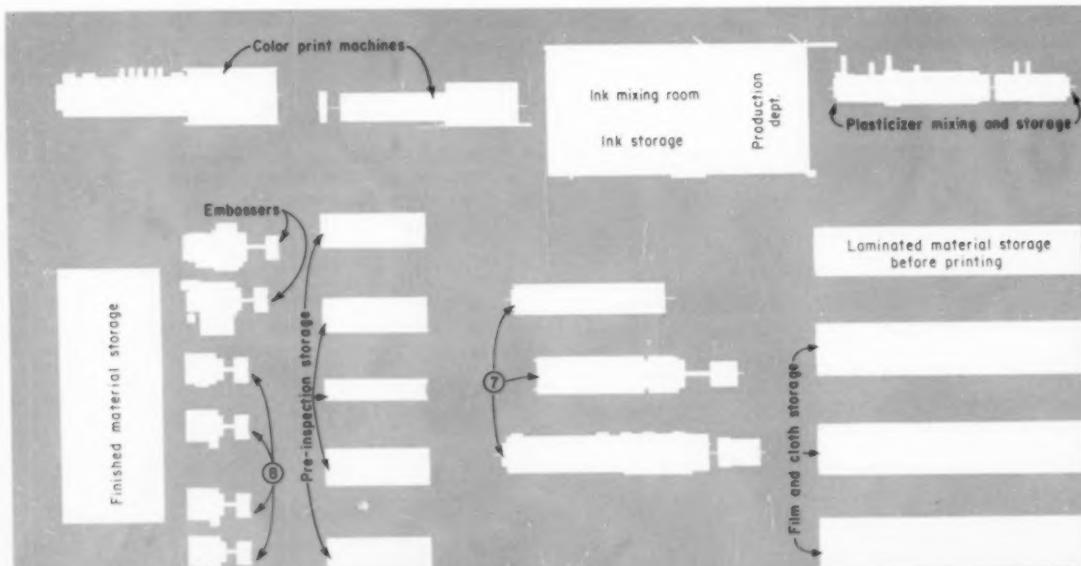
When one of the big three auto makers establishes a facility geared to produce millions of yards of vinyl-coated automotive trim material annually; when this auto maker turns out to be the Ford Motor Co., often called the father of mass-production techniques, then the industry justifiably has a very intense interest in the operation:

How is the plant laid out?
What's the machinery used?
How about quality control?
Are there any processing innovations?
How are the fantastic materials handling problems solved?

In order to answer these and other questions, editors of MODERN PLASTICS visited the plant, saw it work, interviewed key personnel, and came up with the following report.

In a \$9 million chemical products plant at Mt. Clemens, Mich., a short distance from Detroit, Ford Motor Co. turns out more than 6 million lineal yards of vinyl-coated upholstery decorative trim material annually for the Ford line of passenger cars and trucks. One of the largest installations of its kind, this plant also includes an extrusion department in which the major output is vinyl welting that is used with Ford interior trim.

The Mt. Clemens plant supplies a major portion of Ford's requirements for upholstery trim stocks and vinyl welting. For the 1960 model year, this involves some 250 to 300 combina-

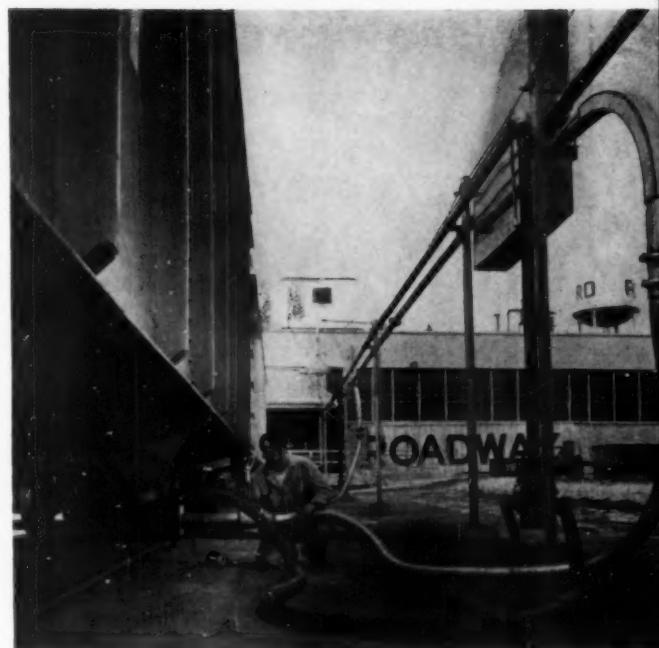


SCHEMATIC DIAGRAM OF FORD'S vinyl fabric laminating plant. Only location of major components are shown. This diagram is not drawn to scale but indicates the general layout of the plant. Process flow is essentially from right to left. Numbers next to equipment link to numbers in captions of accompanying illustrations. Equipment not illustrated in photographs is identified by legend.

tions of color, surface finish, weight, and type of cloth backing. Vinyl-coated fabrics can be produced in widths up to 72 in.; however, the average production width is 54 inches. Individual runs range from a minimum of 200 lineal yards up to 25,000 yards or more. On the average, a period of from 2 to 15 days elapses between receipt of resins, plasticizers, and other raw materials and their conversion into finished coated fabrics.

This plant, consisting of about 220,000 sq. ft., includes space for manufacturing, storage, future expansion, research and development, and administrative and service functions. From the standpoint of layout and equipment, it reflects the latest trends in efficient calendering, laminating, and related operations, including bulk delivery of vinyl material in specially designed railroad hopper cars, piping of plasticizers from central storage tanks to the point of use, and the most advanced electronic and Beta-ray equipment for accurate control of the critical calendering operation.

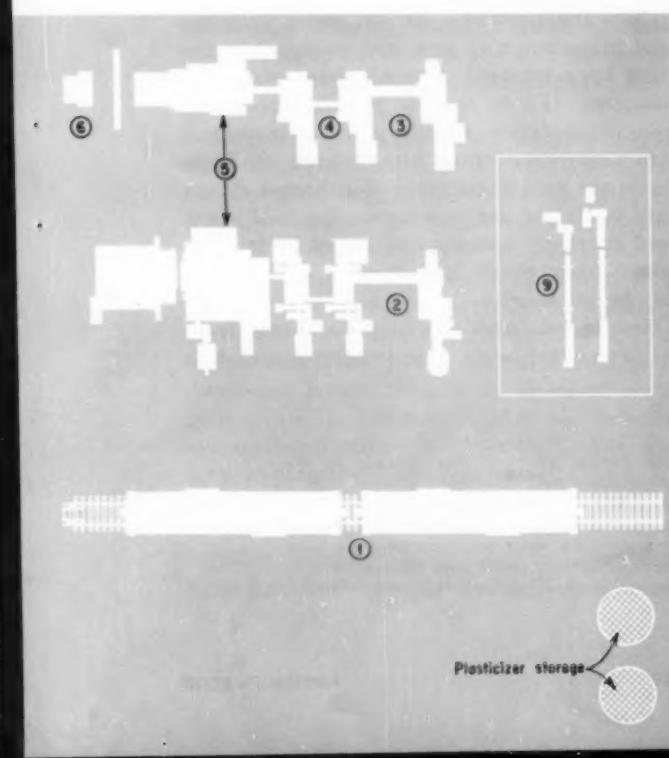
Water used by the plant is supplied by the city system at a pressure of around 40 p.s.i. Full recirculation of water is used on all plant processes. Steam, employed for both heating and processing, is supplied at a line pressure of 185 p.s.i. The plant also utilizes high pressure water (200 p.s.i.) at a temperature of 380° F. Cooling facilities include a 200-ton central unit and about 100 tons additional in individual units;



1—Vinyl resin, delivered to the plant in Airlslide cars holding 100,000 lb. of the plastic material, is transferred by vacuum line directly into storage tanks on third floor level at rate of 15,000 lb. per hour. System eliminates handling of individual packages, minimizes likelihood of contamination.



2—Color pastes, formed by mixing dry color pigments and plasticizers, are stored in 55-gal. drums equipped with agitators until ready to be combined with resins and other ingredients. Present production schedules call for approximately 30 basic colors, which are combined to produce variety of mixtures.





3—Banbury operator cleaning loading chute during operating cycle of the Banbury. The vinyl pre-blender is discharged automatically from the scale hopper immediately behind operator's head. Color paste is added manually to the chute, then the cycle proceeds with the operator performing the blow down operation (shown here) while the Banbury is mixing.



4—After leaving Banbury, the dough-like mixture of vinyl resin and plasticizer, as well as the other ingredients, is worked on a rolling mill until reaching a homogeneous consistency. Passing by conveyor to a second mill, material is worked further to prepare it for the calendering operation. Close control of temperature is maintained by steam heating the rolls.



5—Most critical part of the process is the calendering operation, in which the vinyl film is reduced to its final thickness. Shown in this photo are the Accuray attachments, which by means of Beta rays scan the sheet and accurately measure the film gage, and by positioning the bottom rolls adjust instantaneously for any variations.

purchased electricity is brought into the plant sub-station at 4800 volts. Compressed air, supplied at a pressure of 100 p.s.i., is used for process, instrumentation, and cooling purposes. It is supplied by a 200-hp. compressor.

Vinyl resin, purchased from several suppliers, is delivered to the plant in special Air-slide cars, each containing 50 tons of resin (Photo 1). Material is transferred automatically from the cars by a TransVair vacuum system into plant storage bins with a 45,000-lb. capacity each. Provision is also made for receiving additional supplies, as required, by truck and rail. The plant uses two basic grades of vinyl—one for calendering and one for top coatings and welting.

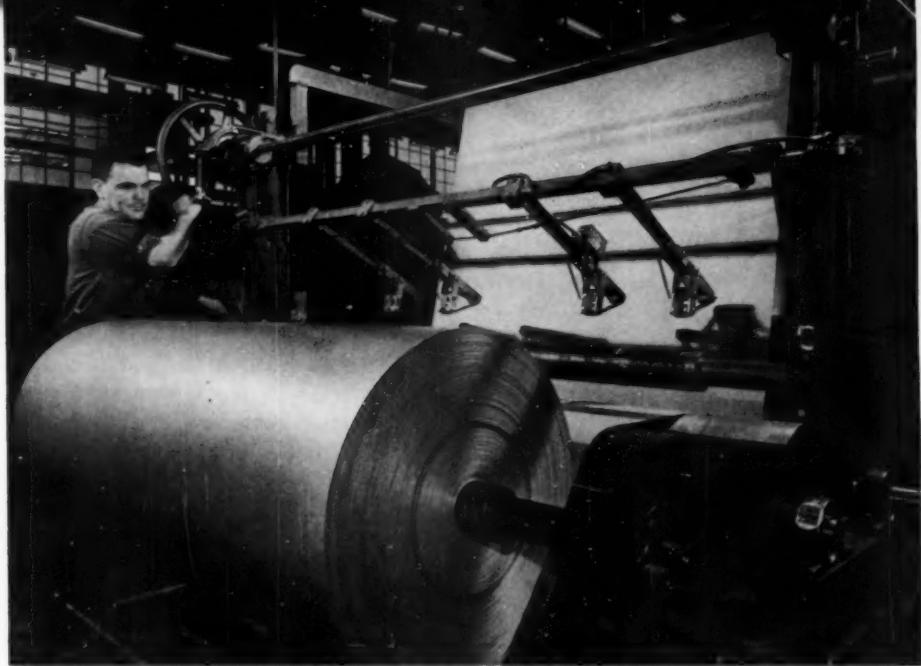
DOP and several proprietary type plasticizers, stored within the plant in two 15,000-gal. tanks, are pumped through pipe lines and dispensed directly at the point of use.

Making vinyl film

Production of vinyl film for the laminating operation begins at the south end of the plant with the dry blending of vinyl resin, plasticizer, filler, stabilizers, and lubricants to produce a dry powder in two Young jacketed ribbon blenders. For this operation, extra ingredients, such as calcium carbonate filler, are added manually. The entire blender rests on a scale so that weight of ingredients can be closely checked as they are added to the mix. After blending, the material drops out on a pneumatic conveyor line and is carried up to intermediate storage in an aftermixer.

Color pastes, which are not added until the next manufacturing step, are prepared in the plant by combining dry color pigments with plasticizer (Photo 2). The paste compounding type of operation affords good color control with minimum dusting. After mixing, the basic pastes are held in standard 55-gal. steel drums until ready for use in coloring the final resin. Ford currently uses approximately 30 primary colors, from which any number of mixtures may be prepared.

Preblended material is next discharged from the aftermixer scale hopper into one of two



6—Leaving the calender after cooling, the vinyl film is wound on rolls, ready to be laminated to cloth backing. A new roll is started immediately. Sections between color changes are cut out for scrap and possible reprocessing. Finished rolls, with film thickness ranging from 3½ to 24 mils, weigh from 1000 to 1500 pounds.

large Banbury-type mixers located on the ground floor level (Photo 3). The larger of these is a 600-lb. unit; the other has a capacity of 300 to 400 pounds. At this stage, the pre-mixed color paste and supplementary plasticizers are added to the batch. The larger line includes two 32- by 84-in. mills of 200 hp. each (32-in. diameter by 84-in. face); the second line has two 22- by 60-in. mills (Photo 4).

Following the milling operations, material moves to one of two calender lines. The larger calender, a 32 by 84 Adamson United Co. unit, has a capacity of 5000 lb. per hr.; the second calender, a 24 by 60 Farrel-Birmingham, has a 3000-lb.-per-hr. rating.

On the larger calender, an inverted-L-type, three different preblends, six film gages and five film widths are handled. As many as 11 different colors may be run on one shift without shutting down operation of the calender. The calender incorporates four chilled iron rolls, 32 in. in diameter and weighing more than 10 tons each. Their temperature may be individually controlled to a 2° F. accuracy through an American Hydrotherm high pressure water system. Top and bottom rolls of the calender are equipped with "roll bending" units with large hydraulic cylinders which can change roll contour as much as 0.001 in. to control the profile of the sheet.

During calendering, the vinyl film is reduced to its final thickness of from 0.0035 to 0.024 in.,

depending upon product use. An important factor in accuracy of the finished film is the use of progressive draw control equipment (Clark Control) which provides fingertip monitoring of the plastic material passing through the calender. Through this system, any adjustment made in the speed of operation at the take-off rolls, embosser, cooling drums, or windup are automatically duplicated in correct proportion at the other stations that are set up in the calendering line.

Through the console of this electronic device, the operator can immediately check and if necessary adjust such variables as roll speeds, roll spacing, film tension, and other factors. These calibrations, in turn, are supplemented by an Industrial Nucleonics Accuray attachment housed in the control console. It embodies a Beta-ray attachment (Photo 5) which automatically gages film stock thickness to a differential of ± 0.0002 in., and by positioning the bottom rolls adjusts instantaneously for any variations. Readings, which are made in terms of ounces per yard, are almost directly comparable to film thickness measured in thousandths of an inch.

Leaving the calender, film is automatically trimmed to finished width, rolled on cores and cut off to desired yardage (Photo 6). Finished rolls, weighing from 1000 to 1500 lb. each, are transferred by lift trucks to nearby storage racks preparatory to laminating. The auto-



7—Under heat and pressure, the film is laminated to cloth backing for additional strength and stability. Film also passes beneath embossing roll which gives it desired Morocco grain or other specified surface texture.



8—After going through top coating operation, in which protective film is applied over the vinyl surface, the vinyl-coated fabric is visually inspected for color, grain and appearance and rereeled in smaller rolls ready for shipment to the trim plant. Color matching against master sample under simulated daylight is an important part of this inspection procedure.

9—Extruded vinyl welting used in seaming the coated trim fabric is produced by these two extruders in the Mt. Clemens plant. Welting may be seen emerging from water bath at end of cooling troughs. Immediately upon leaving die head, material passes over engraved roller which gives it a grained surface matching that of the trim stock.

matic cut-off and winding equipment includes an Emco rotary cutter-winder as well as a Dusenberry slitter.

The laminating process

Three laminators—two Lembo units and a third specially built by Ford—are used in laminating the vinyl film to selected cloth backings.

In the laminating operation, the fabric passes through heated rolls for thorough drying, then the backing and vinyl film are fused together under roller pressure at between 320 and 350° F. (Photo 7). The film and fabric pass through an embossing roll which gives the vinyl the desired surface finish and performs the lamination of the film to the cloth at the same time. For the 1960 Ford line, the standard pattern is a Morocco grain effect; other surface treatments are also used to meet specific trim requirements. After the laminating operation, the coated fabric is cooled, rolled, and racked.

Final step in production of the Ford trim stock consists of "top coating." This relatively new development in the coated fabrics field is a printing process in which a highly volatile liquid ink or coating is applied over the vinyl surface and properly dried, sealing the pores of the coating, imparting greater durability, highlighting the color, and giving the stock an improved "sliding" surface. The impervious film also makes the material easier to wash. The top coat consists of approximately 85% solvent and 15% various solids, including color, vinyl resin, and plasticizers. All upholstery trim stock receives this treatment, following which it is dried, cooled and again wound in rolls.

Five printing units are used for applying the top coatings. Since the process (To page 199)



Added entry in plastic-clad metal derby

POLYESTER- STEEL COIL LAMINATE

Development of a process for bonding decorative polyester film to continuous coils of strip metal now brings to end product manufacturers a new engineering material which is expected to broaden plastics' penetration into many metal fabrication industries.

Two major television manufacturers (Sylvania and Westinghouse) are already using it for cabinets of some of their models on a production basis. Other commercial products include card tables, chairs, and evaporator-coolers. Home appliances, trailers, institutional furniture, optical equipment, automotive trim appointments, and predecorated wall paneling are additional marketing targets.

Until now, this type of predecorated metal product has been available only in cut sheets, which involve costly handling procedures and material waste. From the standpoint of production volume and costs, the difference between stamping out products from continuous coils of predecorated steel as opposed to fabricating from cut sheets is comparable to the vastly different economics involved in printing a large circulation publication on a modern rotary or a hand printing press.

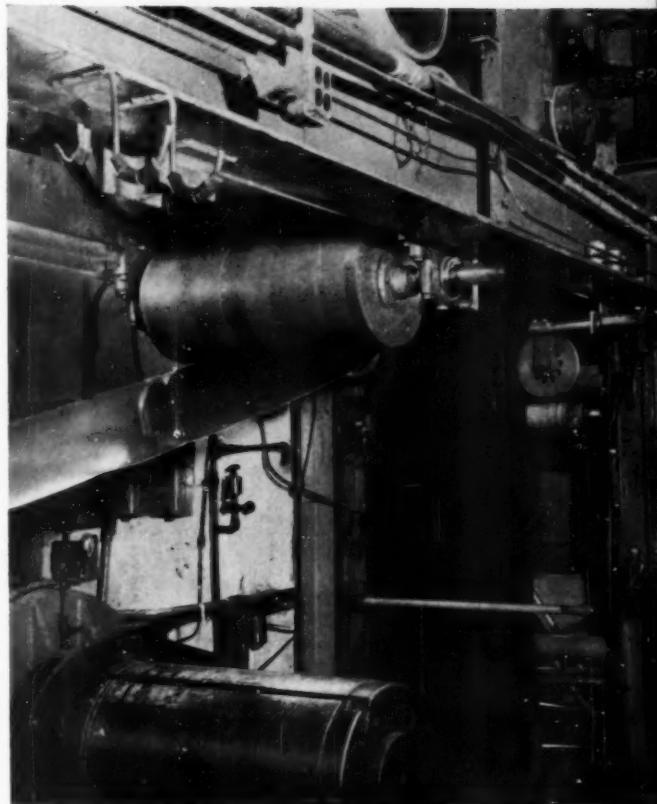
Generally speaking, the cost is about halfway between vinyl-metal laminates and plastic-sol-coated steel.

What are the advantages

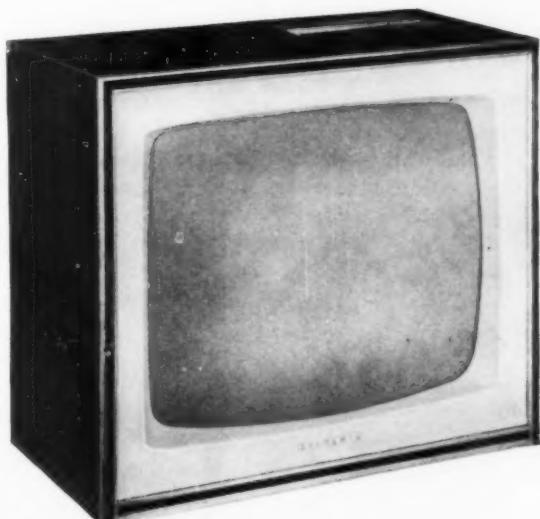
1. Since it comes in coil form, the material need not be hand-fed and requires no change in existing tooling.
2. Although it is predecorated, the material can be fabricated by essentially the same techniques as uncoated steel.

According to National Steel, producer of the plastic-clad metal coil, the decorative surface is protected by the full thickness of a transparent polyester coating. Tests on this coating in 0.3-mil thickness have

(To page 204)



END OF PRODUCTION LINE on which polyester film-steel coil lamination is produced. Material with this particular pattern has gone into TV receiver housings on a commercial basis.



FIRST COMMERCIAL APPLICATION of laminate was in television cabinet, where it contributes high styling and long service life. Sylvania's trademark for this finish is Duragrain.



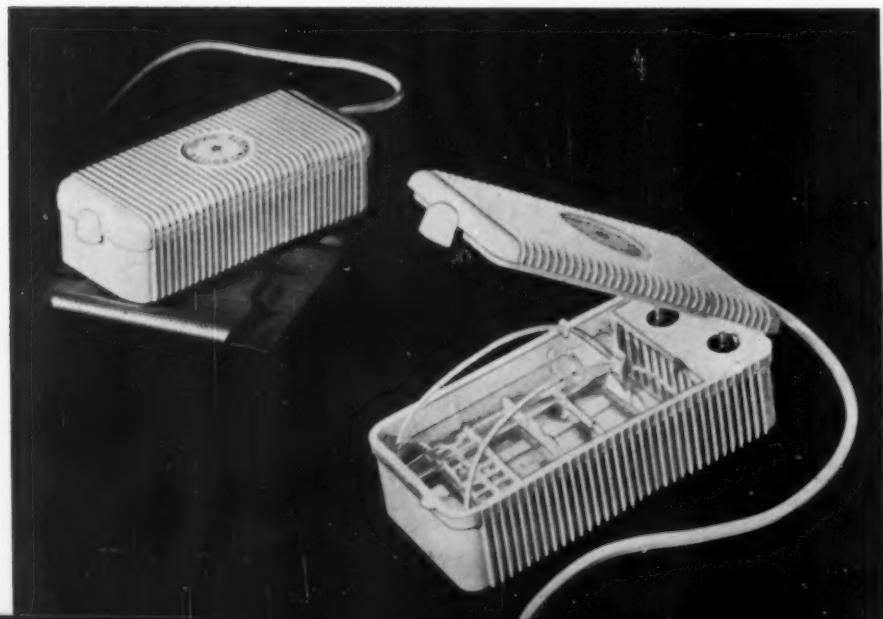
1



2



3



POLYPROPYLENE

Polypropylene has been in the hands of Europeans somewhat longer than it has been in ours. In the case of the Italians the extra time seems to have been well spent in developing and field testing new applications that could be designed specifically for *polypropylene* use. Each of the five applications shown on these pages represents a unique departure from a conventional design that had been originally based either on metal or wood.

With polypropylene booming into prominence in this country in so many different market areas (see "Polypropylene—a product evaluation," MPI, p. 81, March 1960), American manufacturers are studying these new applications. The ideas may come in handy when polypropylene production runs at full capacity.

Here are five possibilities

1—Electric water heater: Housing for this water heater is made up of two injection molded polypropylene hemispheres joined together by a vinyl gasket snapped over their peripheral rims. Directly below the polypropylene housing is a layer of mineral wool insulation and directly beneath that the spherical steel container that holds the water. Reasons for use: polypropylene offers just the right degrees of rigidity and surface hardness to protect the water heater and its delicate electric components from damage; the material's temperature resistance is just right for the job; and the high

DEVELOPMENTS IN ITALY

**Design potential of material is exploited to the fullest
in five outstanding applications reported here**

gloss and attractive surface finish of polypropylene add to the unit's visual appeal.

2—Shoe heels: Competing on same level with wooden heels, injection molded polypropylene heels are doing a thriving business in Italy (one manufacturer alone is currently turning out about 2000 a day). Lighter in weight than wood and with better impact strength than wood, the polypropylene heels are produced either as a finished product (with a wood core and aluminum tip) or in a rougher, unfinished version (also with an aluminum tip) that can be turned and shaped on wood working equipment to meet design requirements.

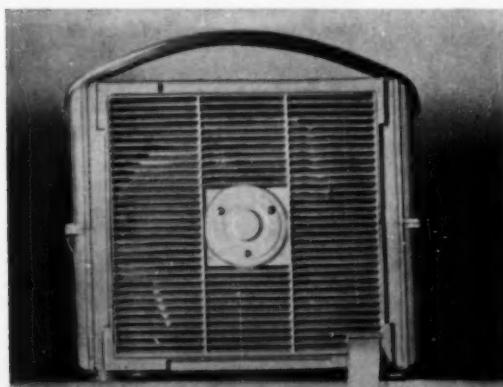
3—Electric sterilizer unit for hypodermic: Molded almost entirely of polypropylene (the only metal parts are the electrical elements and a thin rod which passes through the center of the molded-in hinge that joins cover and case), the new sterilizer unit has already successfully hit the same markets as the more conventional competing models fabricated of stainless steel, aluminum, or enameled steel. Offering sufficient heat resistance for the job (the unit is subjected to boiling water and steam at 212° F.), the polypropylene parts have the added plus of not blackening or staining on repeated boiling (one of the limitations with which the metal models are saddled). The good electrical insulating characteristics of PP have contributed to a more compact design of those sections that house the electric components than would have been possible with metal.

4—Condenser housing for air conditioner: In this two-part unit (evaporator and condenser), outside housing of the condenser section is injection molded in two halves of polypropylene and joined together with mechanical fasteners. Aluminum was the main competition for the job but lost out on the basis of polypropylene's lower specific gravity (0.90 to 0.91 as opposed to 2.7 for aluminum) and hence lighter weight (the condenser is a portable window unit) plus the fact that polypropylene offered added resistance to sunlight, was unaffected by temperature fluctuations, fog, moisture, and dirt.

5—Rotary drum for washing machine: Molded in two halves (drum body proper and a flange which runs around the bottom of the unit), the rotary drum is another example of a product designed specifically for polypropylene. Earlier versions of the drum were fabricated of stainless steel or enameled steel plate. The reasons for the switch: polypropylene's resistance to detergents and high temperatures; its lower specific gravity (which resulted in considerable costs savings over the stainless steel model); and its impact strength (which easily outclassed the easy-to-chip enameled steel version). Precision molding made it possible to produce the plastics parts for a perfect fit and the right degree of balance needed for the high rotary speeds to which the drum is subjected. Comparable metal parts would have required extensive finishing operations.

Credit: Polypropylene for these items supplied by Montecatini Soc. Gen., Milan, Italy.

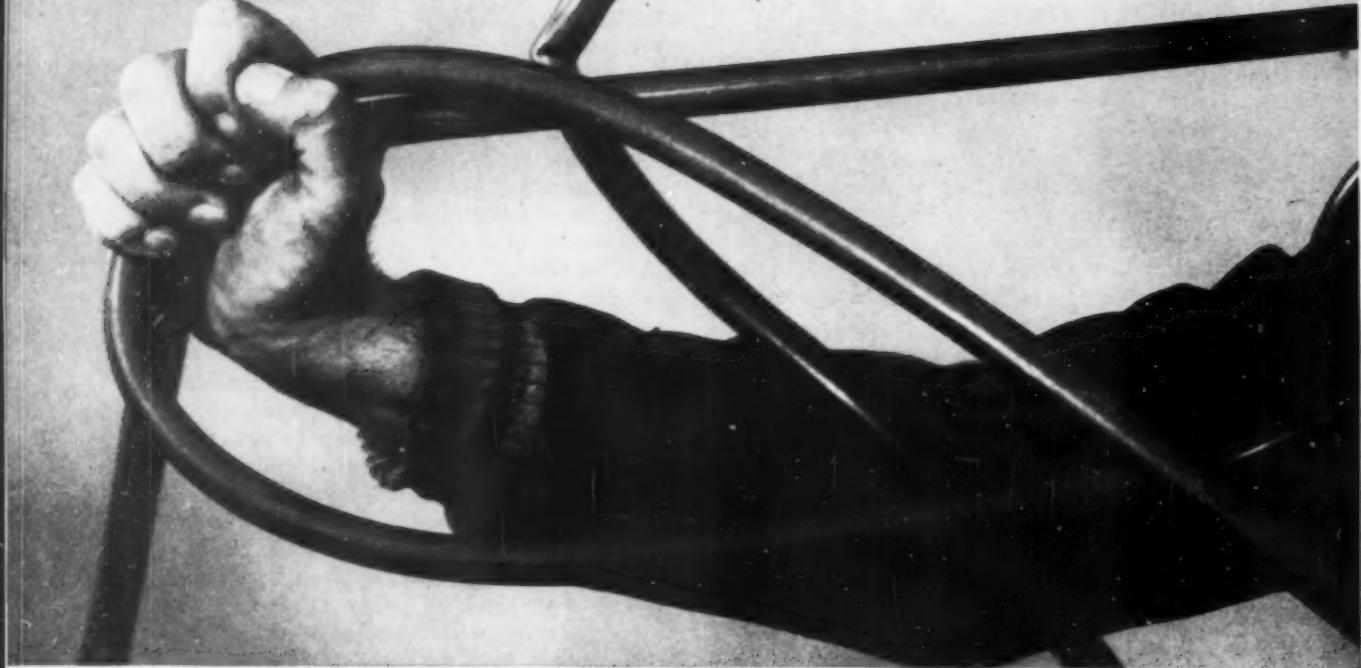
4



5



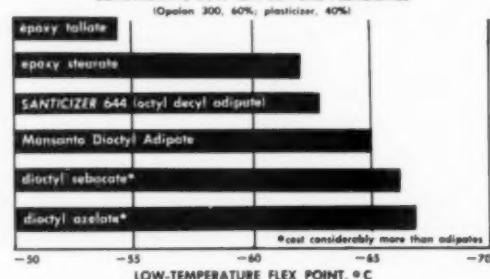
WHO PUT THE HEX ON THE “FLEX”?



Monsanto
Adipate Plasticizers
efficiently improve stability
and low-temperature
flexibility of
vinyl compounds

Vinyls plasticized with Monsanto Adipates not only are outstandingly flexible at low temperatures (as low as minus 65°C with Adipates at 40 per cent concentration) . . . but they *stay flexible*, since Adipates have low volatility and high moisture resistance.

COMPARATIVE LOW-TEMPERATURE FLEXIBILITIES



Here are some advantages of Monsanto Adipate plasticizers in specific applications:

EXTRUSIONS. Vinyl tubing, welting, and garden hose have longer useful service life and stay flexible over a broader temperature range through the use of Monsanto Adipates. Very compatible, and with higher solvating power than other flexibilizing plasticizers, Monsanto Adipates increase lubricity . . . are easily processed.

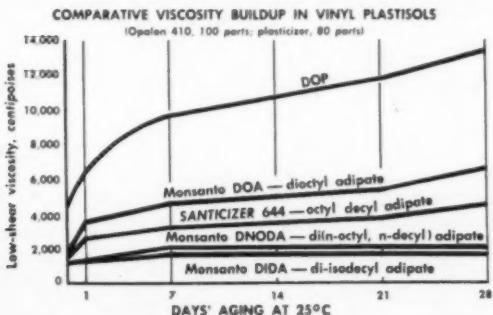


OPALON, SANTICIZER: T.M.'s of Monsanto, Reg. U. S. Pat. Off.

COATED FABRICS. Sheeting and coated fabrics plasticized with Monsanto Adipates have exceptional softness and drape . . . and excellent heat and light stability. And because of low volatility, Monsanto Adipates impart long-lasting flexibility to vinyl auto upholstery and furniture coverings.

INSULATION. Monsanto Adipates assure consistently good electrical properties in vinyl wire coatings and cable sheathing . . . plus increased water-extraction resistance.

PLASTISOLS. Alone, or in combination with other plasticizers, Monsanto Adipates lower initial plastisol viscosity and retard viscosity increase during storage. They're highly compatible . . . cure easily and rapidly.



Monsanto, maker of more plasticizers than any other company, provides these benefits to customers:



precisely right
plasticizer
systems



mixed-shipment
savings



able technical
help in depth

SEND TODAY for complete facts and working samples . . . and prove to yourself that versatile Monsanto Adipates . . .

- equal the performance of higher-priced low-temperature-flexibilizing plasticizers . . .
- give lower flex points and much better compatibility than epoxidized plasticizers . . .
- are your best buy for long-lasting stability and flexibility.

Monsanto Chemical Company
Organic Chemicals Division, Dept. MP,
St. Louis 66, Missouri

Please send me:

- Technical Bulletin PL-304 on DOA
- Technical Bulletin PL-308 on DIDA
- Technical Bulletin PL-316 on DNODA
- Technical Bulletin PL-644 on ODA (SANTICIZER 644)
- Samples of Monsanto Adipates for Testing

Name Title

Company

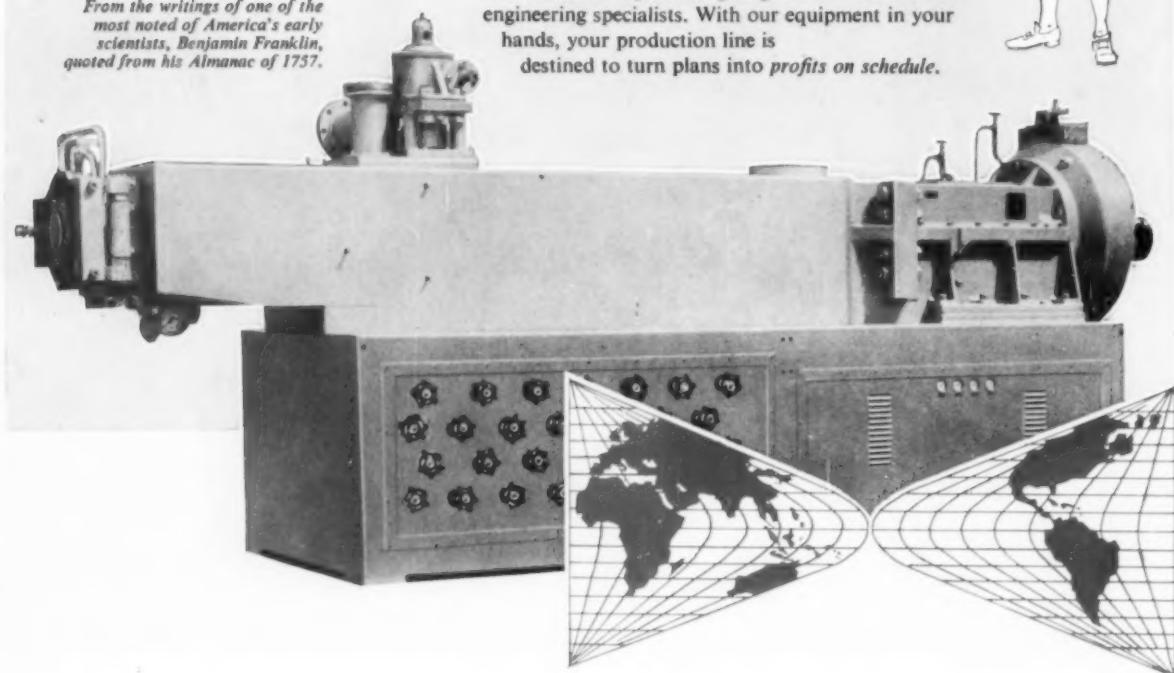
Street

City State

**"The Eye of the master
will do more work
than both his hands"**

*From the writings of one of the
most noted of America's early
scientists, Benjamin Franklin,
quoted from his Almanac of 1757.*

The most versatile key to progress in the manufacture of plastics materials is thorough *understanding!* The very synonym of that all-important characteristic is the unique DUAL WORM design in the compounding-devolatilizing-extruding equipment developed by Welding Engineers. Here, indeed, is the "eye of the master", the capacity to see—and understand—the whole range of hard-to-handle materials including rubber and to maintain quality and rate "as promised and delivered" by Welding Engineers' research and engineering specialists. With our equipment in your hands, your production line is destined to turn plans into profits on schedule.



World-Wide Recognition



**HAS BEEN EARNED BY THE ABILITIES OF WELDING
ENGINEERS' CUSTOM-FITTED DUAL WORM
COMPOUNDER-DEVOLATILIZING-EXTRUDING EQUIPMENT
... BY SUCCESSFUL PERFORMANCE IN EVERY
IMPORTANT PLASTICS PRODUCING AREA IN AMERICA
AND THROUGHOUT THE WORLD.**

Your plans and processes are always held in strictest confidence. Welding Engineers, Inc., Main offices and plant, Norristown, Pennsylvania. Manufacturers of Processing Equipment for the Chemical Industry • U.S. West Coast Sales Representatives: Machinery Sales Co., Los Angeles 58, Calif. • European Sales Representatives: Welding Engineers Ltd., Geneva, Switzerland • Far East Sales Representatives: Marubeni Iida Co., Ltd., Tokyo, Japan.



High-clarity blown polyethylene film

By Joseph Pilaro[†] and Richard Kremer[†]

A method for improving the optical properties of blown polyethylene film by using a tubular annealing chamber has been studied. Theory of the technique is discussed and details of construction and positioning of the annealing chamber are given. Data are given showing how the annealing chamber affects resins of various melt indices and densities at various retention times. Limitations of the technique are also discussed.

In the extrusion of high polymers a surface roughness has been observed which has been ascribed to melt fracture.¹ The occurrence of melt fracture is dependent upon die geometry, shear rate, and molecular structure of the particular polymer involved.²

When extruding polyethylene into a shape such as pipe, or when coating wire, melt fracture is observed as surface imperfections. In the extrusion of blown polyethylene film, melt fracture is observed in certain polymers as poor gloss and clarity and high surface haze.

At given conditions of shear rate the degree to which melt fracture occurs is dependent upon the flow properties of the polymer. Surface roughness will decrease with increasing melt index or density, and with broadening molec-

ular weight distribution². If appearance were the only criterion, a good film resin would need high melt index, high density, and broad molecular weight distribution. However, other film properties such as toughness and stiffness must be considered when selecting a polyethylene resin for blown film; and, for a majority of resins, the resin properties which contribute to toughness impair optical properties.

Counteracting melt fracture

At our laboratories a successful attempt was made to counteract the effects of melt fracture and thus bring greater clarity and gloss to polyethylene films which were known primarily for their high strength characteristics. The mechanism used was the annealing chamber shown in Figs. 1 and 2, right.

By extruding blown tubing, through the annealing chamber, surface roughness caused by melt fracture was minimized. This has been attributed primarily to the increased amount of time that the extrudate was held at a temperature at which the polymer would flow. The flow taking place on the surface of the extrudate during

*Reg. U. S. Pat. Off.

[†]Customer Service Engineers, Polymer Service Laboratories, U. S. Industrial Chemicals Co., Div. of National Distillers & Chemical Corp., Tuscola, Ill.

¹J. P. Tordella, "Capillary Flow of Molten Polyethylene—A Photographic Study of Melt Fracture," *Trans. of the Soc. of Rheology*, Vol. 1, 1957, pp. 203-212; and R. M. Schulken Jr., and R. E. Boy Jr., "Cause of Melt Fracture and Its Relation to Extrusion Behavior," *SPE Tech. Papers*, Vol. VI, 1960, pp. 82-1 to 82-5.

²D. R. Mills, G. E. Moore, and D. W. Pugh, "The Effect of Molecular Weight Distribution on the Flow Properties of Polyethylene," *SPE Tech. Papers*, Vol. VI, 1960, pp. 4-1 to 4-10.

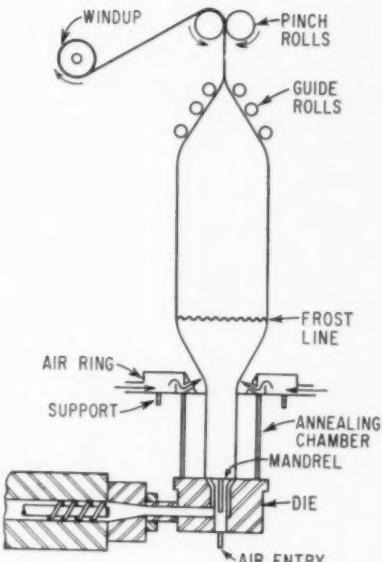


FIG. 1: Schematic diagram of the blown-film extrusion system together with annealing chamber.

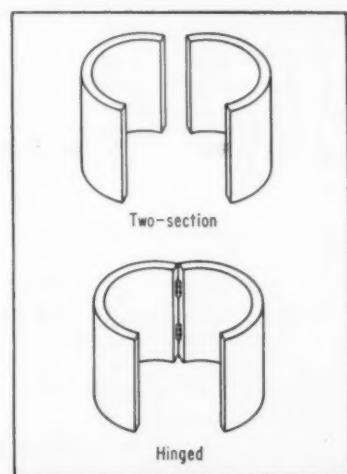


FIG. 2: Annealing chamber types.

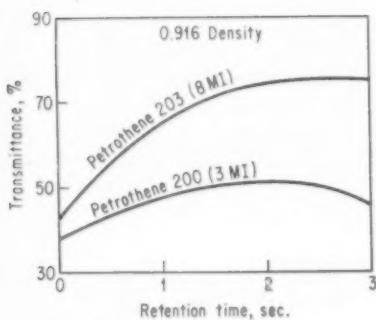


FIG. 3: Film transmittance as a function of retention time.

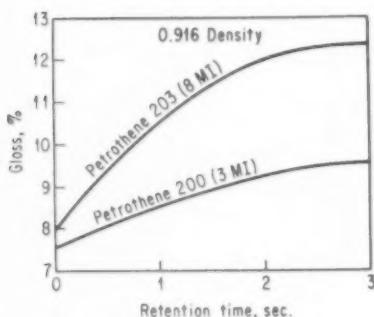


FIG. 4: Film gloss as a function of retention time.

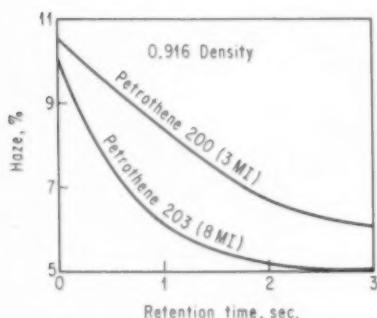


FIG. 5: Film haze as a function of retention time.

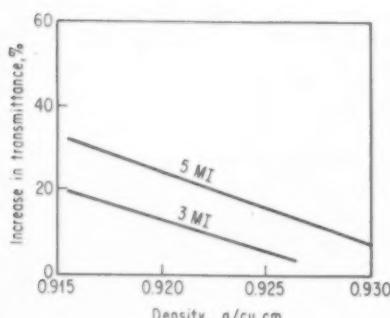


FIG. 6: Transmittance as a function of density at 1 sec. retention time for 3 and 5 melt index resins.

the annealing phase smoothed out the roughened areas of the film, improving both clarity and gloss. (See Table I, below, for resin and film properties dealt with in this article and test methods used.)

It has been suggested that the success of the chamber in improving optical properties is a result of controlled cooling through the crystalline melt point, thus increasing spherulite growth. This theory has been disproved by measuring the density of film produced under identical conditions with and without the annealing chamber. No significant change in film density was caused by the annealing chamber.

Retention of the extrudate at a temperature above the melting point for an extended period also tends to relax stresses in the films which have been formed in the die. This relaxation of stresses has been confirmed by observing the film under polarized light. Films produced without the annealing chamber were observed to be more oriented in the machine di-

rection. The annealing chamber allowed relaxation in the extrudate, resulting in more balanced orientation in the transverse and machine directions. This phenomenon was further confirmed by Elmendorf tear testing of the film. Film extruded through the annealing chamber had a more balanced tear strength than film extruded without the chamber.

The annealing chamber is, therefore, held to serve two purposes. First, it smooths surface imperfections caused by melt fracture and second, it permits the relaxation of stresses in the film. The result is blown polyethylene tubing with improved optical properties and physical properties essentially unchanged except for the improvement in balance of molecular orientation and, consequently, in tear strength.

Construction and positioning of the chamber

The annealing chamber can be made of various materials such as cardboard, glass, or insulated

Table I: Test methods used in determining resin and film properties reported in this paper

Properties	Units	Test method used
Melt index	g./10 min.	ASTM D-1238-52T
Density	g./cu. cm.	Hydrostatic method
Film density	g./cu. cm.	ASTM D-1505-57T
Transmittance	%	USI method (low angle transmittance)
Gloss	%	ASTM D-523-53T
Haze	%	ASTM D-1003-52
Dart drop	g./in.	Weight of dart required to break 15-mil film sample from 25-in. drop.
Elmendorf tear	g./mil	ASTM D-689-44

Table II: Effect on film properties^a of annealing chamber diameter.

Resin	Chamber diameter in.	Transmittance %	Gloss %	Haze %	Dart drop g.	Elmendorf tear MD ^b g./mil	TD ^c g./mil
Petrothene 200 (3 M.I., 0.916 density)	No chamber	19	5.3	19.0	110	150	55
	8	48	8.1	8.3	285	40	100
	10	45	8.3	8.4	290	80	90
	12	43	8.1	9.4	285	50	105

^a2½ in. MPM Extruder with 4-in. die, haul-off speed 40 ft./min. to obtain these data.

^bProperty in machine direction.

^cProperty in direction transverse to machine direction.

Table III: Effect of retention time on optical and physical properties of blown tubing*

Retention time sec.	Chamber height in.	Haul-off speed ft./min.	Haze %	Gloss %	Transmittance %	Dart drop g.	Elmendorf tear MD g./mil	Elmendorf tear TD g./mil
0	0	40	10.5	7.5	38	175	65	75
1	6	30	8.0	8.3	47	250	75	75
1	8	40	8.6	7.8	50	315	35	90
1	10	50	8.1	8.3	56	255	30	95
2	6	15	5.8	9.3	53	165	155	85
2	8	20	7.5	8.0	44	135	90	85
2.1	10	24	7.3	9.5	49	145	55	80
3	6	10	6.9	9.7	42	135	95	100
2.9	8	14	6.6	9.3	45	145	95	100
3.1	10	16	10.0	9.4	35	140	135	95

*All data obtained on 2½ in. MPM with 4-in. die and 330° F. extrusion stock temperature.

metal. Comparisons of chambers of identical size made from different materials showed little difference in optical improvements due solely to the material. Cardboard chambers lined with aluminum foil give slightly higher transmittance values than unlined chambers. This was attributed to the reflective surface of the foil and the resulting hotter annealing chamber atmosphere.

Cardboard cylinders with side walls ½ in. thick were used in most of the experimental runs described in this article. These cores are easily obtained in a variety of heights and diameters, and are thermally stable at normal die operating temperatures.

Constructing the chamber in two sections or hinged, as shown in Fig. 2, made it possible to position or remove it without breaking the film bubble.

The annealing chamber is positioned on the die with the air ring resting upon it. Although lightweight air rings may be supported by the chamber, it is recommended that independent supports be supplied, as indicated in Fig. 1. These may be connected to the die stand or to the haul-off canopy supports, depending on which is more convenient.

The chamber must be in a concentric position around the annular orifice of the die. The air ring must be parallel to the die face and concentrically located

relative to the die orifice and the chamber. In order to minimize turbulence inside the chamber and to maintain a high temperature therein, the orifice diameter of the air ring should be slightly smaller than the inside diameter of the chamber.

The chamber diameter is not critical in its effect on film properties. However, excessively large chambers have been shown to prevent optimum improvement. (See Table II, left). Best results were obtained with a chamber diameter 2 to 3 in. larger than the die diameter.

The effect of film retention time and chamber heating

The height of the annealing chamber is one of variables in film retention time. Retention time is the period of time required for a cross section of film to travel from the die lips to the top of the annealing chamber during extrusion. It is calculated from the formula:

$$R = \frac{5C}{S} \quad \text{Eq. 1}$$

where R = retention time (sec.), C = chimney height (in.), S = haul-off speed (ft./min.).

At a constant haul-off speed, retention time is increased as chimney height increases. At a constant chimney height, retention time is increased as haul-off speed slows down.

Figures 3 to 5, left, show

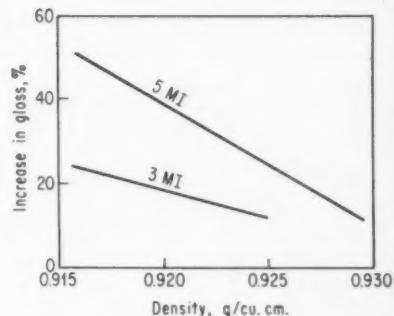


FIG. 7: Gloss as a function of density at 1 sec. retention time for 3 and 5 melt index resins.

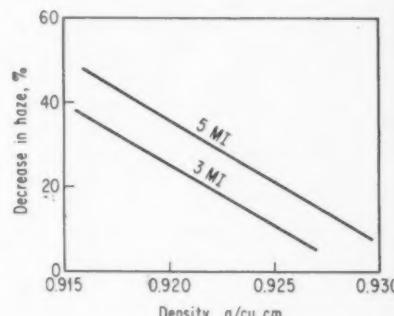


FIG. 8: Haze as a function of density at 1 sec. retention time for 3 and 5 melt index resins.

the effect of increasing retention time on the optical properties of film produced from two Petrothene polyethylene film resins of the same density and different melt indexes. These graphs show that improvements in gloss, transmittance, and haze have a steep slope from zero retention time (no chimney) to 2 sec. retention time. At this point the rate of improvement begins to level. Therefore, from the standpoint of optical improvement, a retention time of 2 sec. appears optimum.

Of course, as is often the case, it is not possible from the output or production standpoint to run at optimum conditions. Commercial production speeds for other than ultra thin film would be in the range of 75 to 100 ft. per minute. Using Eq. 1 we find that a 2-sec. retention time and a haul-off speed of 75 ft./min. would require an annealing chamber 30 in. high. Equipment limitations prevented experimental runs with a chamber this tall, but work done with a 24-in. chamber showed that, while optical improvement was accom-

Table IV: Variation of film properties with melt index and density

Resin	Melt	Density	Retention	Haze	Gloss	Trans-	Sand	Dart	Elmendorf tear	
	index		time						MD	TD
	g./10 min.	g./cu. cm.	sec.	%	%	%	ft.	drop	g./mil	
Petrothene 239-27	5	0.929	1	7.6	11.8	72	1.5	80	140	105
			0	7.9	10.2	68	1	215	175	170
Petrothene 205	3	0.924	1	6.8	12.3	61	4	—	60	100
			0	7.9	10.9	54	1	—	165	145
Petrothene 200-28	3	0.916	1	6.8	9.3	57	7.5	85	40	75
			0	10.5	7.5	38	6	175	65	75
Petrothene 201	5	0.916	1	5.1	10.4	70	>9	255	45	65
			0	9.5	6.9	39	>9	280	60	45

plished, the short distance between molten film and nip roll (6 ft. on equipment used in this study) caused serious blocking of the warm film and marking of the film by nip rolls. Also, gage control was difficult to maintain.

Since significant optical improvement is obtained, and since much more realistic chamber heights and haul-off speeds are possible at a retention time of 1 sec., this seems to be optimum from the standpoint of production. The shorter retention time also appears significantly to increase impact strength as indicated by dart drop values in Table III, p. 117. Other film properties remain essentially unaffected by the annealing chamber, with the exception of Elmendorf tear strength which appears to balance its strength characteristics in the machine and transverse directions when the chamber is added. The results of Elmendorf tear testing were difficult to interpret due to poor reproducibility of this test.

Preliminary experiments have been made with heated annealing

chambers in an attempt to increase the annealing effect at lower chamber heights. Although results are still inconclusive, it appears that when a heated chamber is used, shorter retention times may be used to obtain maximum optical improvements at faster haul-off speeds. Future work is planned to determine the full possibilities and to investigate how the shorter retention time affects film impact strength.

Basic resin properties and the annealing chamber

The optical properties of some polyethylene resins are more easily improved by means of the annealing chamber than others. A series of experiments was designed to determine improvement in optical properties as related to melt index and density. Standard conditions were established for all runs, using a 2 1/2-in. MPM extruder with a 14:1 L/D ratio and a polyethylene-type screw. The blown tubing die was a 4-in. Hartig. The blow-up ratio was held at 2.2:1. Retention time in

the annealing chamber was 1 sec., with the extrusion melt temperature maintained at 320° F. The frost line was held to 6 in. from the die, or 6 in. from the top of the annealing chamber, respectively.

The data obtained are shown in graph form in Figs. 6 to 8, pp. 116-117, as percent improvement in the properties. Both transmittance and gloss improve more for low-density resins than higher-density resins; these optical properties improve more for higher-melt index resins than for those with lower melt index. The annealing chamber decreased the haze of low-density resins more than higher-density resins. Higher melt index resins are improved in haze more than those with lower melt index.

Combining the information, it can be said that optical properties improve more with resins which normally have poorer optical properties. This is supported by the data in Table IV, above, which show a pronounced improvement in Petrothene 200 (3 M.I., 0.916 density) than in Petrothene 239 (5 M.I., 0.929 density).

One method often used commercially to improve optical properties is raising the frost line. Some benefit to the optical properties can thus be obtained. However, tear and impact strength are impaired. Control of wrinkles and gage is also very difficult.

An experiment was carried out with Petrothene 201, (5 M.I., 0.916 density) and Petrothene 203-28 (8 M.I., 0.916 density) to show the difference in optical properties of film made with the annealing chamber and film (To page 206)

Table V: Effects of frost line height and annealing chamber on certain properties

Resin	Frost	Trans-	Gloss	Haze	Dart	Elmendorf	
	line					tear	MD
	height	in.	%	%	drop	g./mil	TD
Petrothene 201 (5/M.I., 0.916 density)	8*	39	6.9	9.5	280	60	45
	20*	52	7.7	8.6	225	50	70
	20*	70	10.4	5.1	255	45	65
Petrothene 203- 28 (8 M.I., 0.916 density)	8*	43	7.9	9.9	125	120	55
	19*	46	7.5	9.1	130	110	60
	20*	66	10.6	5.9	210	40	70

*Without annealing chamber.

With 8 in. high annealing chamber.



Letters molded of Tenite Butyrate by Adler Silhouette Letter Co., 11843 W. Olympic Blvd., Los Angeles 64, California.

The plastic that spells long life for changeable letters... **BUTYRATE**

Up in Toronto, you can find the world's largest changeable-letter sign, or as it's known north of the border—"readograph." The red, green, and black letters of this sign, 10,000 pounds of them, are all molded of a special weather-resistant formulation of Tenite Butyrate plastic.

As changeable displays have become increasingly popular among all types of retailers in recent years, Butyrate has become the most popular plastic changeable-letter material—and for good reason. Butyrate is a material whose toughness cannot be matched by any other weather-durable sign plastic. And it remains tough even in

the cold weather to which this Toronto sign is sometimes exposed.

Toughness naturally is of primary concern to changeable-display customers because letters that are handled as often as once each day are sure to receive some rough treatment. Butyrate, "the tough sign plastic," has the impact resistance necessary to keep replacements at a minimum.

Molded letters are but one of many applications for Tenite Butyrate in the sign industry. Extruded sheet of this Eastman plastic is easily vacuum formed into imaginative sign faces and display elements characterized by outstanding visibility and long service life.

If you are not already familiar with the excellent outdoor performance characteristics of Tenite Butyrate—and the chance it offers you to improve the service life of outdoor products—write for further information to EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
BUTYRATE
an Eastman plastic

How to predict structural behavior of RP laminates

By Lawrence Fischer*

A layer of fibrous glass is assumed to behave structurally as an orthotropic material. On that basis, stress-strain relationships are presented for a single layer, and used to obtain the stress distribution in a laminate composed of many layers subjected to in-plane axial and shear stresses. The mathematical procedure is shown to be simplified for an isotropic laminate. An interaction equation is presented to predict failure of each layer in a laminate. A simple example is presented to clarify the mathematical procedure, and experimental data are shown to verify the accuracy of the theory.

With the increasing use of glass-fabric-base plastic laminates in aircraft, missile, and space structures, and in building and other types of construction, it is necessary to predict the structural behavior of such laminates with some degree of assurance.

Each layer of glass fabric in such a laminate has glass fibers that are generally oriented at right angles to each other (orthogonally) in the warp and fill directions, as shown in Figure 1A, right. The layer may have different numbers of glass fibers in the warp and fill directions, so that it is assumed to act as an orthotropic material, that is, a material having one set of properties in one direction, and another set at right angles to that direction not necessarily the same.

Two special types of orthotropic layers are shown in Figs. 1B and 1C. A crossplied layer has the same number of fibers in the warp and fill directions; a unidirectional layer has no fibers oriented in the fill direction.

A fibrous glass laminate is composed of individual layers whose warp directions are not necessarily oriented at the same angle with respect to each other.

This paper considers the struc-

tural behavior of fibrous glass laminates subjected to axial and shear loads with their loci in the plane of the laminate.

The following assumptions are made in this analysis:

1. A layer of glass fibers is elastic and homogeneous.
2. A layer of glass fibers is orthotropic.

3. Layers in a glass fibers laminate are connected by a material that has infinite shear rigidity.

4. Dimensions of a fibrous glass laminate are such that buckling will not occur.

A single layer of glass fibers is first considered. The applied axial and shear stresses f_x , f_y , f_{xy} are parallel to a pair of orthogonal axes x and y separated from the natural axes α and β parallel to the fibers by an angle ϕ , as shown in Fig. 2, right.

The stresses acting on a unit element of the layer are shown in Fig. 3, p. 122. These stresses may be resolved, as will be shown, into axial and shear stresses parallel to the α and β axes (see Fig. 3B). Due to the orthotropic nature of a layer of glass fibers the elastic constants, E , G , μ , and the ultimate axial and shear strengths are generally obtained parallel to the natural axes α and β (axes of warp and fill fibers). The relationship between stresses and strains in these directions in an orthotropic layer can be described

mathematically by the following three equations.

$$\begin{aligned} \epsilon_\alpha &= \frac{f_\alpha}{E_\alpha} - \mu_{\beta\alpha} \frac{f_\beta}{E_\beta} & \text{Eq. 1} \\ \epsilon_\beta &= \frac{f_\beta}{E_\beta} - \mu_{\alpha\beta} \frac{f_\alpha}{E_\alpha} & \text{Eq. 2} \\ \epsilon_{\alpha\beta} &= \frac{f_{\alpha\beta}}{G_{\alpha\beta}} & \text{Eq. 3} \end{aligned} \quad \text{Group 1}$$

These equations may be solved for stresses f_α , f_β , $f_{\alpha\beta}$ in terms of strains ϵ_α , ϵ_β , $\epsilon_{\alpha\beta}$. The resulting set of equations is:

$$\begin{aligned} f_\alpha &= \frac{E_\alpha}{\lambda} \epsilon_\alpha + \frac{E_\alpha \mu_{\beta\alpha}}{\lambda} \epsilon_\beta & \text{Eq. 4} \\ f_\beta &= \frac{E_\beta}{\lambda} \epsilon_\beta + \frac{E_\beta \mu_{\alpha\beta}}{\lambda} \epsilon_\alpha & \text{Eq. 5} \\ f_{\alpha\beta} &= G_{\alpha\beta} \epsilon_{\alpha\beta} \quad \text{where} \quad \text{Eq. 6} \\ \lambda &= 1 - \mu_{\alpha\beta} \mu_{\beta\alpha} \quad \text{Eq. 7} & \end{aligned} \quad \text{Group 2}$$

The relationship between

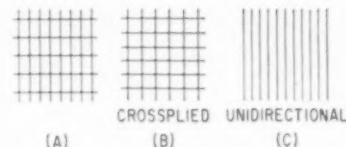


FIG. 1: Examples of orthogonally and orthotropic orientation of fibers in laminates. Letters are identified in text.

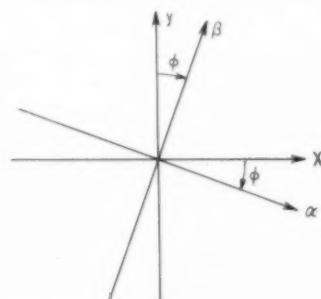


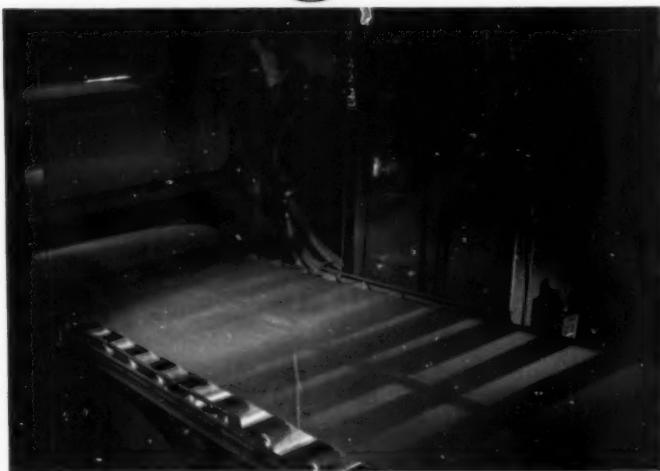
FIG. 2: Axes of x and y are directions of applied stress; α and β are natural axes of oriented fibers.

*Structural Development Engineer, Grumman Aircraft Engineering Corp., Bethpage, N. Y.

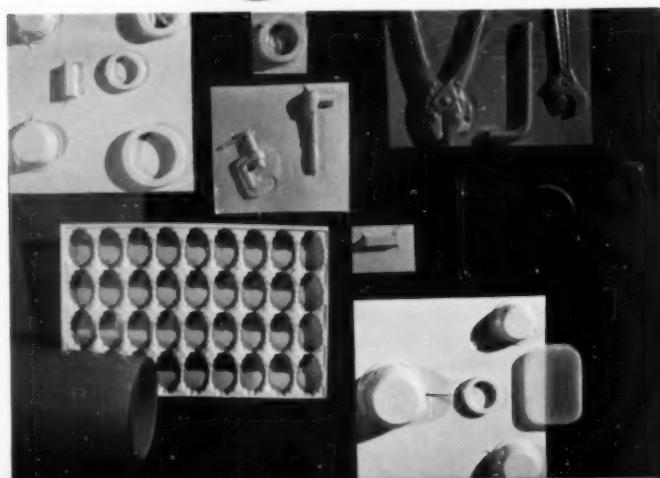
From a paper presented at the 15th Technical and Management Conference of the Reinforced Plastics Div. of S.P.I., Feb. 1960, Chicago, Ill.



Finding the right vinyl . . .  does it with research in depth.



Pinpointing application  does it on production-scale equipment.



vinyl research with one purpose . . . Your Product!

Helping you find better and more efficient ways to produce quality vinyl products is the purpose of Diamond's new multi-million-dollar laboratories.

The applications laboratory is equipped with the newest, most advanced machinery to simulate production conditions. Every important method of fabricating vinyl products can be duplicated.

Ask our field representative how this applications research facility — and its highly skilled technical staff — can serve you.

Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.



New plastics laboratory, Painesville, Ohio.



**Diamond
Chemicals**

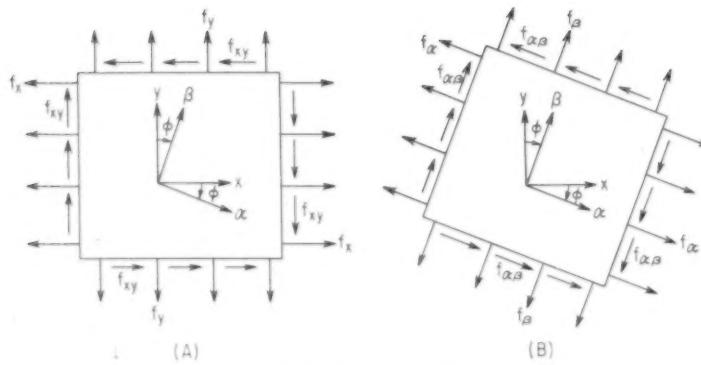


FIG. 3: Schematic of stresses acting on a unit element of a single fiber layer in a laminate.

stresses and strains in the x and y directions is:

$$\begin{aligned} f_x &= b_{11} \epsilon_x + b_{12} \epsilon_y \\ &\quad + b_{13} \epsilon_{xy} \quad \text{Eq. 8} \\ f_y &= b_{21} \epsilon_x + b_{22} \epsilon_y \\ &\quad + b_{23} \epsilon_{xy} \quad \text{Eq. 9} \\ f_{xy} &= b_{31} \epsilon_x + b_{32} \epsilon_y \\ &\quad + b_{33} \epsilon_{xy} \quad \text{Eq. 10} \end{aligned} \quad \text{Group 3}$$

The coefficients b_{11} , b_{12} , . . . b_{33} are functions of the known elastic constants E_a , E_β , G_{ab} , μ_{ab} , and the angle ϕ , as given in Basic Equations on p. 128.

Inversion of Group 2 of the equations results in the following set of equations, wherein the

strains ϵ_x , ϵ_y , ϵ_{xy} are expressed in terms of the stresses f_x , f_y , f_{xy} .

$$\begin{aligned} \epsilon_x &= a_{11} f_x + a_{12} f_y \\ &\quad + a_{13} f_{xy} \quad \text{Eq. 11} \\ \epsilon_y &= a_{21} f_x + a_{22} f_y \\ &\quad + a_{23} f_{xy} \quad \text{Eq. 12} \\ \epsilon_{xy} &= a_{31} f_x + a_{32} f_y \\ &\quad + a_{33} f_{xy} \quad \text{Eq. 13} \end{aligned} \quad \text{Group 4}$$

The coefficients a_{11} , a_{12} , . . . a_{33} are also defined on p. 128 in terms of b_{11} , b_{12} , . . . b_{33} . Groups 3 and 4 are derived (1)¹ and discussed elsewhere (3).

In order to evaluate the strains ϵ_a , ϵ_β , ϵ_{ab} , and thus obtain from

¹ Numbers in parentheses link with references on p. 209.

Definitions of terms

Notation and sign convention (See Figure 3)

x and y axes: any pair of orthogonal axes.

α and β axes: orthogonal axes parallel to the natural axes (warp and fill) of a layer of fibrous glass.

ϕ : angle between x and α axes, and y and β axes, measured clockwise from x to α and y to β .

f_x , f_y , f_{xy} : average axial and shear stresses applied to a laminate parallel to the x and y axes.

f_α , f_β , f_{ab} : axial and shear stresses in a layer of fibrous glass parallel to the x and y axes.

ϵ_x , ϵ_y , ϵ_{xy} : axial and shear strains per unit length parallel to the x and y axes.

ϵ_a , ϵ_β , ϵ_{ab} : axial and shear strains per unit length parallel to the natural axes α and β .

E_a , E_β : moduli of elasticity of a layer of fibrous glass, parallel to the natural axes α and β respectively.

G_{ab} : modulus of rigidity of a layer of fibrous glass, parallel to the natural axes α and β .

μ_{ab} , μ_{ba} : Poisson's ratios (first subscript refers to direction of stress; second subscript refers to direction of strain) parallel to the natural axes α and β .

F_a , F_β , F_{ab} : ultimate axial and shear stresses of a fibrous glass layer parallel to the natural axes α and β .

Subscript i : particular layer of a fibrous glass laminate.

Sign Convention: Tensile stresses and strains are positive. Compressive stresses and strains are negative. Angles measured clockwise from x to α axes are positive.

Group 2 stresses f_a , f_β , f_{ab} , the following set of equations (1) is

$$\begin{aligned} \epsilon_a &= \epsilon_x \cos^2 \phi + \epsilon_y \sin^2 \phi \\ &\quad - \epsilon_{xy} \sin \phi \cos \phi \quad \text{Eq. 14} \end{aligned}$$

$$\begin{aligned} \epsilon_\beta &= \epsilon_x \sin^2 \phi + \epsilon_y \cos^2 \phi \\ &\quad + \epsilon_{xy} \sin \phi \cos \phi \quad \text{Eq. 15} \end{aligned} \quad \text{Group 5}$$

$$\begin{aligned} \epsilon_{ab} &= 2(\epsilon_x - \epsilon_y) \sin \phi \cos \phi \\ &\quad + \epsilon_{xy} (\cos^2 \phi - \sin^2 \phi) \quad \text{Eq. 16} \end{aligned}$$

Groups 2 through 5 will now be applied to determine the axial and shear stresses in each layer of a fibrous glass laminate subjected to total axial and shear stresses applied parallel to a set of orthogonal axes, x and y . Consider a glass fiber layer with the warp direction α_1 , oriented such that it is separated from the x axis by an angle φ_1 . Let another layer of glass fibers containing not necessarily the same glass fabric be placed on the first layer, oriented at an angle φ_2 . Assume many layers similarly oriented, as shown in Fig. 4, p. 127.

By Assumption 3 given on page 120, the layers must deform together, and

$$\begin{aligned} \epsilon_{\alpha_1} &= \epsilon_{\alpha_2} = \epsilon_{\alpha_3} \\ &= \dots \epsilon_N \quad \text{Eq. 17} \end{aligned}$$

$$\begin{aligned} \epsilon_{\beta_1} &= \epsilon_{\beta_2} = \epsilon_{\beta_3} \\ &= \dots \epsilon_N \quad \text{Eq. 18} \end{aligned} \quad \text{Group 6}$$

$$\begin{aligned} \epsilon_{ab_1} &= \epsilon_{ab_2} = \epsilon_{ab_3} \\ &= \dots \epsilon_{abN} \quad \text{Eq. 19} \end{aligned}$$

where N = number of layers.

The effective values of b_{11} , b_{12} , etc. for the composite laminate are the average values known for each layer (5).

$$\bar{b}_{11} = \frac{1}{T} \sum_{i=1}^n b_{11i} t_i \quad \text{Eq. 20}$$

$$\bar{b}_{12} = \bar{b}_{21} = \frac{1}{T} \sum_{i=1}^n b_{12i} t_i \quad \text{Eq. 21}$$

where t = thickness of each layer
 T = total thickness of laminate
 \bar{b}_{11} , \bar{b}_{12} , etc. are averages for the composite laminate b_{11i} , b_{12i} , etc. are defined on p. 128.

The average values, \bar{a}_{11} , \bar{a}_{12} , etc., for the composite laminate are obtained from \bar{b}_{11} , \bar{b}_{12} , etc. (see p. 128) and substituted in equations of Group 4 to obtain the strains ϵ_x , ϵ_y , ϵ_{xy} in terms of the known average stresses f_x , f_y , f_{xy} acting on the composite laminate. Equations of Group 5 are then applied to obtain the strains ϵ_a , ϵ_β , ϵ_{ab} in each layer. Substituting ϵ_a , ϵ_β , ϵ_{ab} in equations of Group 2, (To page 127)

Plaskon

NYLON FILMS ARE TOUGH RESIST OIL AND GREASE



Plaskon Nylon Films protect a wide variety of hard-to-hold packaged goods with a combination of top-grade properties . . . **High strength:** Over 10,000 psi tensile; 2 to 4 times stronger than conventional films. **Abrasion resistance:** Tabor tests show 4 to 6 times more wear resistance. **Transparency:** Excellent — variable as desired. **Oil and chemical resistance:**

Outstanding . . . outperforms all other films. **Odor barrier properties:** Outstanding. Tests show superiority over other commercial films. **Printing and dyeing properties:** Good, without special treating . . . flexo and roto. **Heat sealing:** Seals well at 420 to 500°F, 0.5 seconds dwell; impulse seals, too. More complete Nylon Film information is yours for the asking.

PLASTICS AND COAL CHEMICALS DIVISION
40 Rector Street, New York 6, N. Y.



Profitable idea from

Plaskon® ... FOILS PUT ON UREA CLOSURES



The use of foils can provide a fresh new way to decorate your urea closures and containers. Your old molds are candidates in many instances for a whole new line of gaily decorated closures and containers — at savings not to be overlooked!

Now that it is possible to combine the high quality of urea closures with permanently molded-in decorations, the design possibilities are intriguing — cosmetic caps that add another touch of glamour; pancake makeup boxes with bright, wear-resisting

COLORFUL, LASTING PATTERNS AND CONTAINERS



patterns; dusting powder boxes with sparkling floral designs! In other areas — pharmaceutical closures with molded-in product identification and trademark; brand-name-identified jiggers and secondary closures for liquors.

Foils can now be obtained to brighten alpha cellulose urea and melamine parts . . . including curved surfaces. We'll be happy to work with you to adapt the use of foils to your application.

PLASTICS AND COAL CHEMICALS DIVISION
40 Rector Street, New York 6, N. Y.



Plaskon WOOD-FLOUR UREA CAPS IT WELL...FOR LESS



Plaskon Wood-Flour Filled Urea beats the closure properties of the older general-purpose plastics—but matches them in cost!

See if your present closure material matches these advantages: Bleed proof and color-fast • Scratch-resistant, non-electrostatic surfaces • Unaffected by ordinary solvents, impermeable to volatiles • High

torque strength • Odor-free • Excellent for high-speed automatic production.

Plaskon Wood-Flour Filled Urea, available in closure brown and standard black, is thoroughly checked out and proven in lab and field. It's ready to top your closure savings—and profits. Contact us for more information, and for molded samples.

PLASTICS AND COAL CHEMICALS DIVISION

40 Rector Street, New York 6, N. Y.



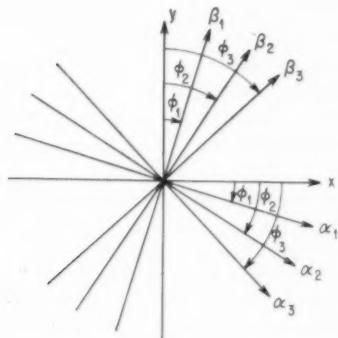


FIG. 4: Analysis of several layers of fibers in a laminate.

the axial and shear stresses for f_a , f_β and $f_{a\beta}$ are obtained for each layer of the laminate.

Isotropic laminate

The previous discussion considers the general case of unrestricted layer orientation. If the layers have the same glass fabric and are oriented such that the number of layers N is three or more and the angle between the warp directions of adjacent layers is equal to π/N , we have an isotropic laminate (properties same in all directions). The procedure that has been previously described for determining f_a , f_β , $f_{a\beta}$ in each layer of a laminate is then simplified.

The values of \bar{b}_{11} , \bar{b}_{12} , etc. in equations of Group 7 and the corresponding values of \bar{a}_{11} , \bar{a}_{12} , etc. become independent of ϕ (5), and the stress-strain relationship equations of Group 4 reduce to:

$$\epsilon_x = \frac{\bar{f}_x}{E} - \mu \frac{\bar{f}_y}{E} \quad \text{Eq. 22}$$

$$\epsilon_y = \frac{\bar{f}_y}{E} - \mu \frac{\bar{f}_x}{E} \quad \text{Eq. 23}$$

$$\epsilon_{xy} = \frac{\bar{f}_{xy}}{G} \quad \text{Eq. 24}$$

where

$$\bar{E} = \frac{1 - \mu^2}{\lambda} \left[\frac{3}{8} E_a + \frac{3}{8} E_\beta + \frac{1}{8} (2E_a \mu_{\beta a} + 4 \lambda G_{a\beta}) \right] \quad \text{Eq. 25}$$

$$\mu = \frac{E_a + E_\beta + 6E_a \mu_{\beta a} - 4 \lambda G_{a\beta}}{3E_a + 3E_\beta + 2E_a \mu_{\beta a} + 4 \lambda G_{a\beta}} \quad \text{Eq. 26}$$

$$\bar{G} = \frac{1}{\lambda} \left[\frac{1}{8} (E_a + E_\beta - 2E_a \mu_{\beta a}) + \frac{1}{2} G_{a\beta} \right] \quad \text{Eq. 27}$$

The derivation of \bar{E} , μ , \bar{G} is found in (5). Equations of Group 8 eliminate the necessity of obtaining values of b_{11} , b_{12} , etc. for each layer when the laminate is isotropic. The values of ϵ_x , ϵ_y , ϵ_{xy} are substituted in equations of Group 5 to obtain ϵ_a , ϵ_β , $\epsilon_{a\beta}$ for each layer. Equations of Group 2 are then applied to obtain the stresses f_a , f_β , $f_{a\beta}$ in each layer.

Laminate failure

As determined by tests (3), (6), (7), (8), laminate failure occurs before the ultimate strengths F_a , F_β , $F_{a\beta}$ are obtained. An equation based on the distortion energy strength criteria was derived (4) and extended at Grumman (to include different elastic constants in the warp and fill directions) to predict failure of any layer in a fibrous glass laminate. The equation, which considers interaction of the axial and shear stresses, is

$$1 = \frac{(f_a)^2}{(F_a)} + \frac{(f_\beta)^2}{(F_\beta)} + \frac{(f_{a\beta})^2}{(F_{a\beta})} - K \frac{f_a f_\beta}{F_a F_\beta} \quad \text{Eq. 28}$$

where

$$K = \frac{E_a (1 + \mu_{\beta a}) + E_\beta (1 + \mu_{a\beta})}{2 \sqrt{E_a E_\beta (1 + \mu_{\beta a})(1 + \mu_{a\beta})}} \quad \text{Eq. 29}$$

Since the laminate is a monolithic structure, laminate failure will occur at a value of applied stress higher than the value required to cause failure of the

weakest layer. This is seen by comparing the experimental and computed values in Fig. 7, p. 128.

A typical case

A fibrous glass laminate is composed of 12 layers of Type 181 glass fabric; six layers have their warp directions oriented parallel to the x axis, and six layers are oriented 45° from the x axis (see Fig. 5, below).

The laminate is subjected to tensile stresses applied parallel to the x axis. Based on the material properties given in the following equations, the strength of the laminate will be determined.

$$F_{a1} = F_{\beta 1} = 45,000 \text{ p.s.i.} \quad \text{Eq. 30}$$

$$F_{a\beta 1} = F_{\beta a 1} = 14,000 \text{ p.s.i.} \quad \text{Eq. 31}$$

$$E_{a1} = E_{\beta 1} = 2.88 \times 10^4 \text{ p.s.i.} \quad \text{Eq. 32}$$

$$E_{\beta 1} = E_{a 1} = 2.66 \times 10^4 \text{ p.s.i.} \quad \text{Eq. 33}$$

$$G_{a\beta 1} = G_{\beta a 1} = 0.810 \times 10^4 \text{ p.s.i.} \quad \text{Eq. 34}$$

$$\mu_{a\beta 1} = \mu_{\beta a 1} = 0.17 \quad \text{Eq. 35}$$

$$\mu_{a\beta 1} = \mu_{\beta a 1} = 0.16 \quad \text{Eq. 36}$$

$$t_1 = t_2 = 0.0625 \quad \text{Eq. 37}$$

$$\phi_1 = 0^\circ \quad \text{Eq. 38}$$

$$\phi_2 = 45^\circ \quad \text{Eq. 39}$$

$$\phi_3 = 0^\circ \quad \text{Eq. 40}$$

The values of b_{11} , b_{12} , etc. for each layer are:

$$b_{111} = 2.96 \times 10^6 \quad \text{Eq. 41}$$

$$b_{121} = b_{211} = 0.468 \times 10^6 \quad \text{Eq. 42}$$

$$b_{311} = b_{311} = 0 \quad \text{Eq. 43}$$

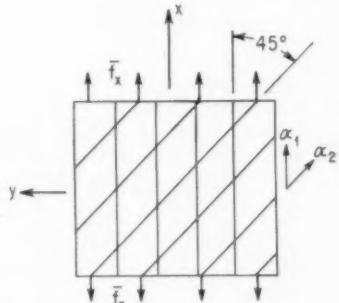


FIG. 5: Analysis of a glass fiber laminate composed of 12 layers of Type 181 glass fabric (see example in text).

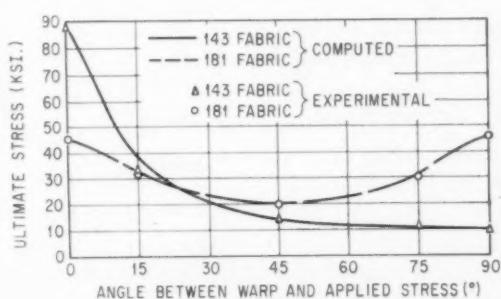


FIG. 6: Relationship between the ultimate stress and angle between warp and applied stress, showing agreement between computed and experimental data.

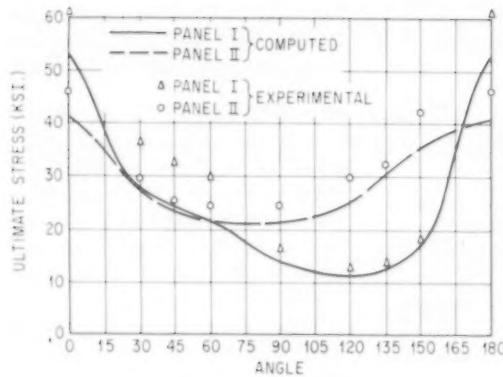


FIG. 7: Relationship between ultimate stress and angle between axes of reference and applied stress.

The two values indicate that when $\bar{F}_x = 32,600$ p.s.i., a stress redistribution occurs and failure will be caused by a stress greater than 32,600 p.s.i. and less than 40,200 p.s.i.

Discussion and conclusions

Accuracy of mathematical theory: The validity of the assumptions made in the mathematical theory is dependent on the many material variables that are intrinsic to the composition of fibrous glass. Fibrous glass is not homogeneous, since the glass fibers do not occupy exactly the same locations throughout the laminate. Although the glass fibers are elastic, stresses applied at an angle other than parallel to the warp or fill directions do not result in elastic behavior.

The assumption that a layer of glass fibers acts as an orthotropic material also depends on the homogeneity and elasticity of the material. Assumption 3, which is given on p. 120, (To page 208)

$$\begin{aligned} b_{221} &= 2.76 \times 10^6 & \text{Eq. 44} \\ b_{211} &= b_{321} = 0 & \text{Eq. 45} \\ b_{231} &= 0.810 \times 10^6 & \text{Eq. 46} \\ b_{112} &= 2.48 \times 10^6 & \text{Eq. 47} \\ b_{122} &= b_{212} = 0.851 \times 10^6 & \text{Eq. 48} \\ b_{132} &= b_{312} = 0.0514 \times 10^6 & \text{Eq. 49} \\ b_{222} &= 2.48 \times 10^6 & \text{Eq. 50} \\ b_{232} &= b_{322} = -0.0514 \times 10^6 & \text{Eq. 51} \\ b_{332} &= 1.19 \times 10^6 & \text{Eq. 52} \end{aligned}$$

From the equations of Group 7 the average values of b_{11} , b_{12} , etc. for the composite laminate are:

$$\begin{aligned} \bar{b}_{11} &= 2.76 \times 10^6 & \text{Eq. 53} \\ \bar{b}_{12} &= \bar{b}_{21} = 0.660 \times 10^6 & \text{Eq. 54} \\ \bar{b}_{13} &= \bar{b}_{31} = -0.0257 \times 10^6 & \text{Eq. 55} \\ \bar{b}_{22} &= 2.62 \times 10^6 & \text{Eq. 56} \\ \bar{b}_{23} &= \bar{b}_{32} = 0.0257 \times 10^6 & \text{Eq. 57} \\ \bar{b}_{33} &= 1.000 \times 10^6 & \text{Eq. 58} \end{aligned}$$

The values of \bar{a}_{11} , \bar{a}_{12} , etc. are then determined (right).

$$\begin{aligned} \bar{a}_{11} &= 0.394 \times 10^{-6} & \text{Eq. 59} \\ \bar{a}_{12} &= \bar{a}_{21} = -0.0990 \times 10^{-6} & \text{Eq. 60} \\ \bar{a}_{13} &= \bar{a}_{31} = 0.00757 \times 10^{-6} & \text{Eq. 61} \\ \bar{a}_{22} &= 0.409 \times 10^{-6} & \text{Eq. 62} \\ \bar{a}_{23} &= \bar{a}_{32} = 0.00796 \times 10^{-6} & \text{Eq. 63} \\ \bar{a}_{33} &= 1.004 \times 10^{-6} & \text{Eq. 64} \end{aligned}$$

The values of \bar{a}_{11} , \bar{a}_{12} , etc. are substituted in equations of Group 4 to obtain ϵ_x , ϵ_y , ϵ_{xy} .

$$\begin{aligned} \epsilon_x &= 0.394 \times 10^{-6} \bar{f}_x & \text{Eq. 65} \\ \epsilon_y &= 0.0990 \times 10^{-6} \bar{f}_x & \text{Eq. 66} \\ \epsilon_{xy} &= -0.00757 \times 10^{-6} \bar{f}_x & \text{Eq. 67} \end{aligned}$$

Substituting in equations of Group 5, we obtain:

$$\begin{aligned} \epsilon_{\alpha 1} &= 0.394 \times 10^{-6} \bar{f}_x & \text{Eq. 68} \\ \epsilon_{\beta 1} &= 0.0990 \times 10^{-6} \bar{f}_x & \text{Eq. 69} \\ \epsilon_{\alpha \beta 1} &= 0.00757 \times 10^{-6} \bar{f}_x & \text{Eq. 70} \\ \epsilon_{\alpha 2} &= 0.144 \times 10^{-6} \bar{f}_x & \text{Eq. 71} \\ \epsilon_{\beta 2} &= 0.152 \times 10^{-6} \bar{f}_x & \text{Eq. 72} \\ \epsilon_{\alpha \beta 2} &= 0.493 \times 10^{-6} \bar{f}_x & \text{Eq. 73} \end{aligned}$$

Substituting in equations of Group 1, we obtain:

$$\begin{aligned} f_{\alpha 1} &= 1.120 \bar{f}_x & \text{Eq. 74} \\ f_{\beta 1} &= 0.0874 \bar{f}_x & \text{Eq. 75} \\ f_{\alpha \beta 1} &= 0.00613 \bar{f}_x & \text{Eq. 76} \\ f_{\alpha 2} &= 0.497 \bar{f}_x & \text{Eq. 77} \end{aligned}$$

Thus, the stress distribution in each layer is obtained in terms of the average applied stress \bar{f}_x . The interaction equations (Eq. 28 and 29) are then applied to determine the maximum average applied stress \bar{F}_x that will cause failure of each layer.

$$\begin{aligned} \bar{F}_{x1} &= 40,200 \text{ p.s.i.} & \text{Eq. 80} \\ \bar{F}_{x2} &= 32,600 \text{ p.s.i.} & \text{Eq. 81} \end{aligned}$$

Basic Equations

The equations for b_{11} , b_{12} , etc. determine the coefficients in equations of Group 2. The expressions for a_{11} , a_{12} , etc. determine the coefficients in equations in Group 3.

$$\begin{aligned} b_{11} &= \frac{1}{\lambda} [E_\alpha \cos^4 \phi + E_\beta \sin^4 \phi + (2E_\alpha \mu_{\beta\alpha} + 4\lambda G_{\alpha\beta}) \sin^2 \phi \cos^2 \phi] \\ b_{12} &= b_{21} = \frac{1}{\lambda} [(E_\alpha + E_\beta - 4\lambda G_{\alpha\beta}) \sin^2 \phi \cos^2 \phi + E_\alpha \mu_{\beta\alpha} \\ &\quad (\cos^4 \phi + \sin^4 \phi)] \\ b_{13} &= b_{31} = \frac{1}{\lambda} [(E_\beta - E_\alpha \mu_{\beta\alpha} - 2\lambda G_{\alpha\beta}) \sin^2 \phi \cos \phi - (E_\alpha - E_\alpha \mu_{\beta\alpha} \\ &\quad - 2\lambda G_{\alpha\beta}) \sin \phi \cos^2 \phi] \\ b_{22} &= \frac{1}{\lambda} [E_\beta \cos^4 \phi + E_\alpha \sin^4 \phi + (2E_\alpha \mu_{\beta\alpha} + 4\lambda G_{\alpha\beta}) \sin^2 \phi \cos^2 \phi] \\ b_{23} &= b_{32} = \frac{1}{\lambda} [(E_\beta - E_\alpha \mu_{\beta\alpha} - 2\lambda G_{\alpha\beta}) \sin \phi \cos^2 \phi - (E_\alpha - E_\alpha \mu_{\beta\alpha} \\ &\quad - 2\lambda G_{\alpha\beta}) \sin^2 \phi \cos \phi] \\ b_{33} &= \frac{1}{\lambda} [(E_\alpha + E_\beta - 2E_\alpha \mu_{\beta\alpha}) \sin^2 \phi \cos^2 \phi + \lambda G_{\alpha\beta} (\cos^2 \phi - \sin^2 \phi)^2] \end{aligned}$$

where $\lambda = 1 - \mu_{\alpha\beta} \mu_{\beta\alpha}$

$$\begin{aligned} a_{11} &= \frac{b_{22} b_{33} - b_{23}^2}{B} & a_{22} &= \frac{b_{11} b_{33} - b_{13}^2}{B} \\ a_{12} &= \frac{b_{13} b_{23} - b_{12} b_{33}}{B} = a_{21} & a_{23} &= \frac{b_{11} b_{13} - b_{11} b_{23}}{B} = a_{31} \\ a_{13} &= \frac{b_{12} b_{23} - b_{13} b_{22}}{B} = a_{32} & a_{33} &= \frac{b_{11} b_{22} - b_{12}^2}{B} \end{aligned}$$

where $B = b_{11} b_{22} b_{33} - b_{11} b_{33}^2 + 2b_{12} b_{23} b_{13} - b_{12}^2 b_{33} - b_{13}^2 b_{22}$

Eastman Plasticizers

Dimethyl phthalate

Diethyl phthalate

Di-(methoxyethyl) phthalate

Di-isobutyl phthalate

Dibutyl phthalate

Dibutyl sebacate

Diethyl isophthalate (DOIP)

Diethyl phthalate (DOP)

Diethyl adipate (DOA)

Diethyl azelate (DOZ)

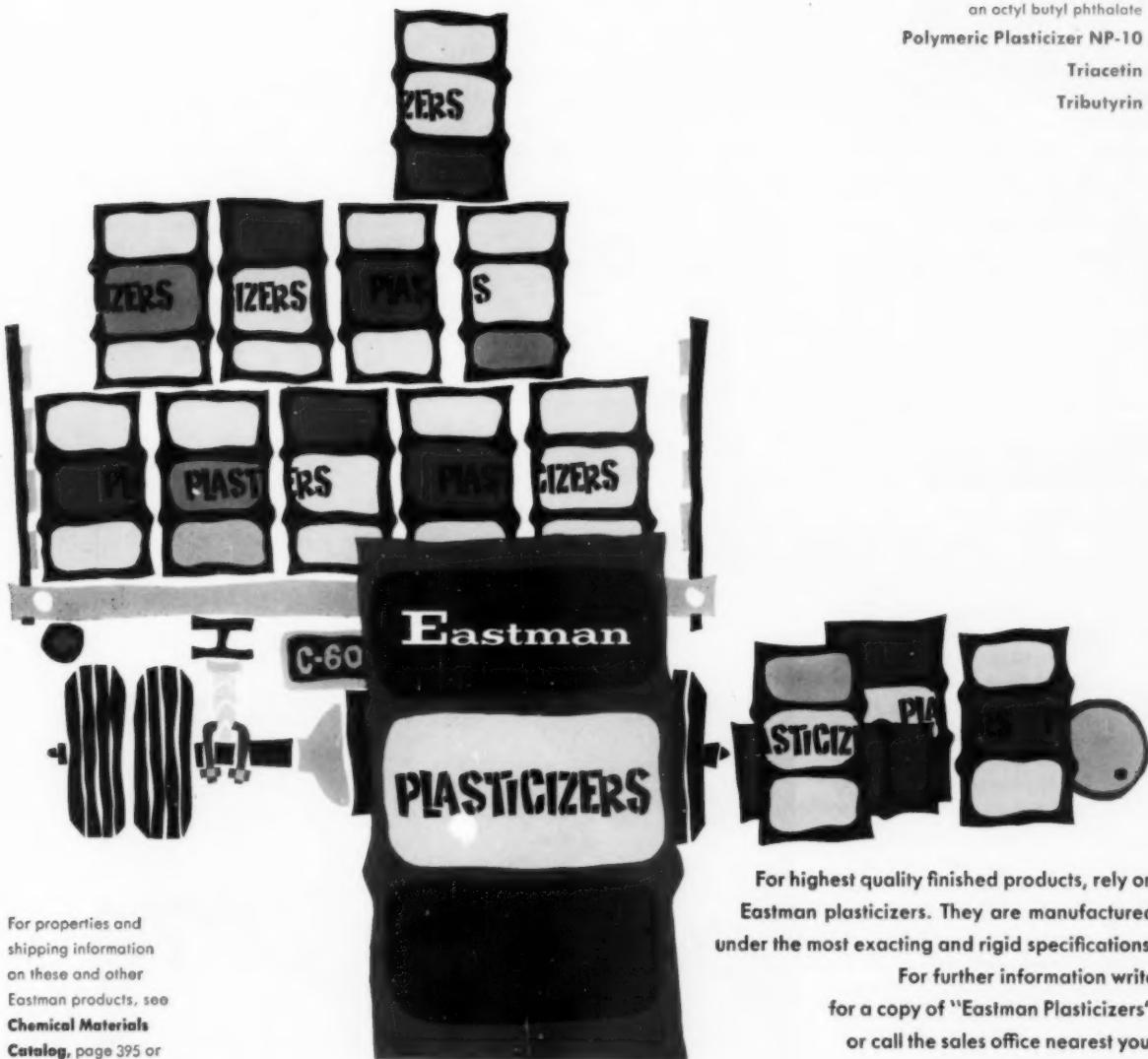
Plasticizer 84

an octyl butyl phthalate

Polymeric Plasticizer NP-10

Triacetin

Tributyrin



For properties and
shipping information
on these and other
Eastman products, see
**Chemical Materials
Catalog**, page 395 or
**Chemical Week
Buyers Guide**,
page 97.

For highest quality finished products, rely on
Eastman plasticizers. They are manufactured
under the most exacting and rigid specifications.

For further information write
for a copy of "Eastman Plasticizers"
or call the sales office nearest you.

Eastman CHEMICAL PRODUCTS, INC.

KINGSPORT, TENNESSEE, subsidiary of EASTMAN KODAK COMPANY

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Chicago; Cincinnati; Cleveland; Detroit; Framingham, Massachusetts; Greensboro, North Carolina; Houston; New York; Philadelphia; St. Louis. **West Coast:** Wilson and Geo. Meyer & Company, San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

Design tips for polyolefin parts

How to overcome molding defects in polyolefin parts through proper design

By J. N. Scott*, J. V. Smith*, and D. L. Alexander*

The term polyolefin, as applied to commercially available thermoplastic resins, covers several basic types of materials, including low-, medium-, and high-density polyethylenes, ethylene copolymers, and "isotactic" polypropylene, the most recent addition to this basic resin group. End products vary from soft and flexible to much harder, rigid items. Subdividing even further, we find a wide variety of resin grades specially tailored to do the best job in a specific application. For example, certain linear polyethylene resins have been tailored to meet the stringent requirements of metal insert molding, automotive applications and safety helmets while others have been produced with less toughness to achieve the high flow required for the disposable packages. With such a broad range of properties and applications, the subject of part design can only be treated broadly here.

Polyolefins, while differing among each other considerably in some properties, are all dependent on crystallinity for rigidity, strength, and many other desirable properties. The comparatively high shrinkage normally associated with these resins is also attributable to partial crystallization. The degree of crystallinity in turn, is somewhat dependent on the cooling rate of the molded part; one area of an item, if cooled more slowly than another, will reach a higher percentage crystallinity and exhibit greater shrinkage. This possibility of non-uniform shrinkage is perhaps the most important characteristic to be considered in designing polyolefin items.

Distortion of flat section

Undoubtedly, the chief problem encountered in injection molding polyolefin resins has been distortion of items having large flat sections. Investigations have revealed

that these problems have usually resulted from small differences in shrinkage over the area of the item. This lack of uniform shrinkage reflects inadequate or improper cooling, a high degree of molecular orientation in the gate area, or packing of excessive resin into certain sections of the part.

Much progress has been made in overcoming distortion of polyolefin items through proper mold design, improved equipment, correct molding procedures and new resin

developments. However, even with these advances, difficulty is still occasionally encountered with certain types of items, primarily those having large flat sections. Although it may be possible to injection mold this type of item, it is difficult to maintain the precise balance of conditions necessary to produce a perfectly flat part. A very slight "molded-in" stress, a small amount of packing, improper ejection, or even subsequent handling can cause distortion.

Rigidity can be achieved, product quality improved, and the molding operation simplified by incorporating certain features in the

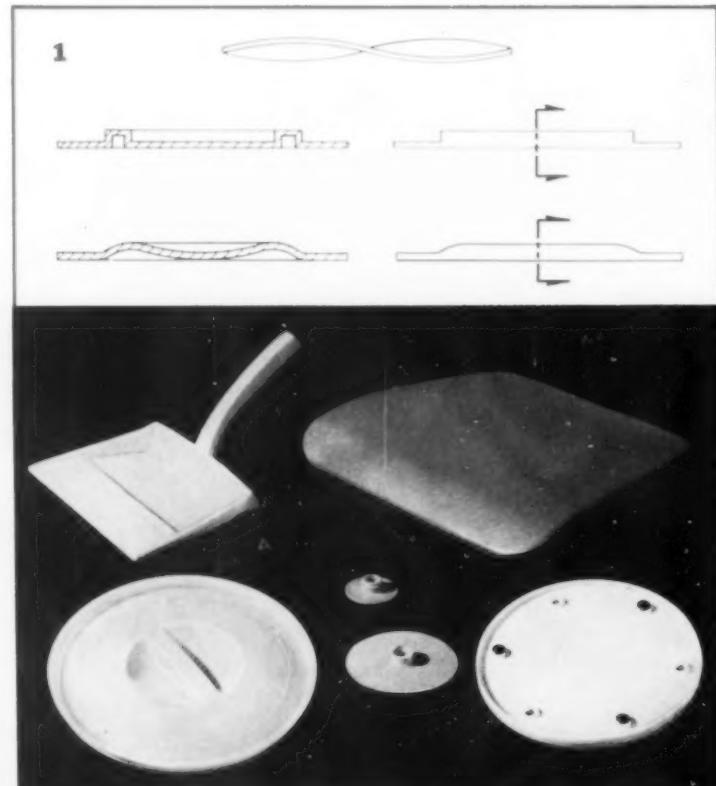


FIG. 1: Geometrical designs which improve rigidity and eliminate warpage in flat sections. FIG. 2: Molded items in which the principles shown in Fig. 1 have been applied to eliminate warpage.



FIRE retardant
for PLASTISOLS:
CHLOROWAX[®] LV by DIAMOND

Suggested Formulation for Flame Retardant Plastisol

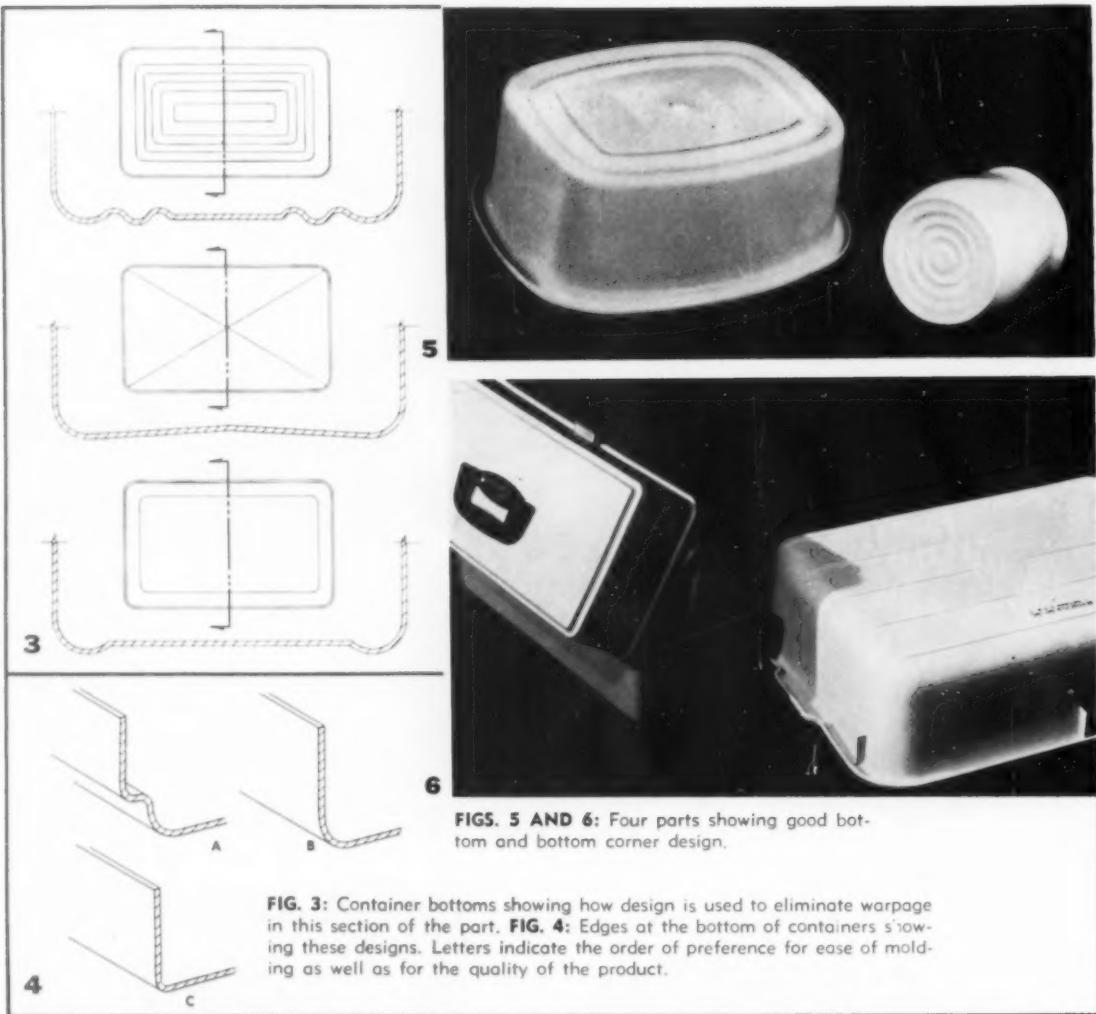
	Parts
Diamond Alkali PVC-70	100
DIOP	18
Santicizer 141 (1)	45
Chlorowax LV	10
Antimony Trioxide	10
Tinuvin P (2)	0.05
Mark KCB (3)	2.5
Paraplex G-62 (4)	5

(1) Monsanto Chemical Company (3) Argus Chemical Corporation
 (2) Geigy Chemical Corporation (4) Rohm and Haas Company

Viscosity	Brookfield Model RVT-200 #6 Spindle 100 RPM
Initial	29.8 poises @ 77° F
48 Hours	44.0 poises @ 77° F
Brittle Point	-47° C
Fadeometer	No discoloration after 300 hours
Diamond Alkali Loop Test	No Spew

By using CHLOROWAX LV as a secondary plasticizer in your formula, you can add greatly to its value and often widely extend its applications at a lower cost. This Chlorowax LV formula can provide a high degree of flame retardation for calendered or impregnated fabrics used in draperies, coverings, tents and for other purposes. Find out more. Write Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

 **Diamond Chemicals**



FIGS. 5 AND 6: Four parts showing good bottom and bottom corner design.

FIG. 3: Container bottoms showing how design is used to eliminate warpage in this section of the part. FIG. 4: Edges at the bottom of containers showing these designs. Letters indicate the order of preference for ease of molding as well as for the quality of the product.

design of most items that are to be produced from polyolefin resins. It is well known that the majority of polyolefin items, such as center-gated bowls, tumblers, etc., exhibit no tendency to warp. Generally, the geometry lends rigidity and is not subject to distortion by minor variations in shrinkage over the part. It follows that in designing an item for a polyolefin resin, it is desirable: 1) to avoid large flat sections, 2) to use features that allow relief of minor stresses, and 3) to incorporate as much structural rigidity as possible. Many of these features also add to the appearance and serviceability.

Geometric considerations

There are many examples of "flat" polyolefin items now in production. Almost invariably the

secret to success is that 1) features have been incorporated to make the item very rigid or 2) although appearing flat, the part is designed with compound radii and actually has no perfectly flat surfaces. Figure 1, p. 130, illustrates satisfactory features for this type part and Fig. 2, p. 130, is a photograph of a few of such items.

The seat is an excellent example. This item is much easier to produce and is more attractive and functional than it would have been if patterned after the much flatter wooden seats. Similarly, the large flat disk of the Jeri Wheel or the prune jar lid would, likewise, be very difficult to produce warp free without the reinforcement of the perpendicular cylindrical section.

The simple change in plane of

the dust pan bottom does much to increase the rigidity of this otherwise very flexible section.

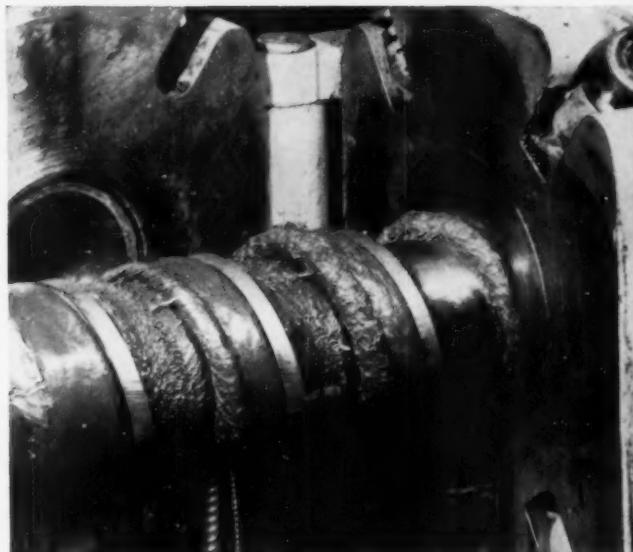
Container bottoms

Perhaps one of the more important areas for consideration in designing many container type items is the bottom. This has traditionally been a flat section, often proportionally large, and is usually the most practical area for gate location. Warpage of polyolefin items can occur in this area or as a result of excessive shrinkage of this section. Fig. 3, above, shows certain features that, if properly employed, can circumvent these problems. The corrugated section is ideal in that rigidity is achieved and the strain that might develop from non-uniform shrinkage can be relieved without distorting the

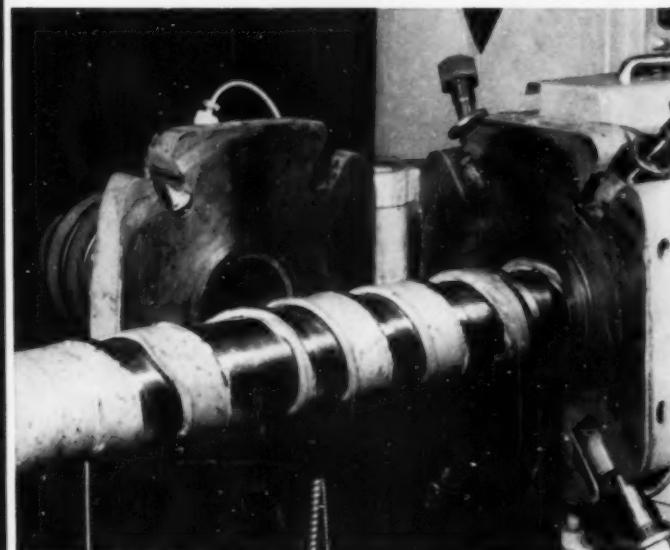
now...clean your extrusion or injection machine in hours...not days...with A-C Cleaning Compound



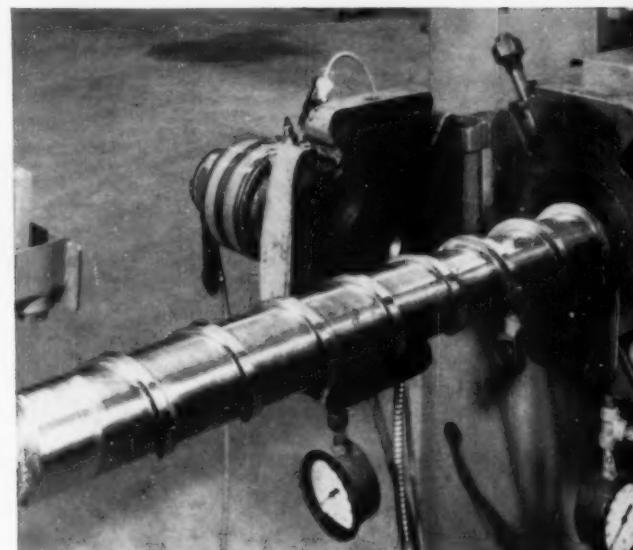
1. Empty hopper and load with A-C Cleaning Compound.



2. Operate machine to purge old material.



3. Note how A-C Cleaning Compound strips off easily.



4. In hours—not days—a clean machine ready for the next run!

If you've been losing days and dollars in making change-overs, here's good news! Allied's Semet-Solvay Petrochemical Division has now developed a cleaning compound that will completely remove any thermoplastic material—and do it in a fraction of the time normally required. The simple procedure is pictured above.

One extruder tells us that he saves \$5,000 by using A-C® Cleaning Compound—cleans a

machine in 1½ hours without tearing it down.

You'll find A-C Cleaning Compound speeds changing material or colors, and eliminates cylinder contamination. It purges without scratching and strips cleanly and easily from extrusion screws without mess.

For a free bulletin telling how this new cleaning compound can save you time and money, just write us at the address below.



SEMET-SOLVAY PETROCHEMICAL DIVISION

Dept. 575-Y, 40 Rector Street, New York 6, N.Y.

National Distribution • Warehousing in Principal Cities



In the heart of the Midwest a reliable source of formaldehyde

There are many good reasons why Hercules is looked to as a leading source for a dependable supply of formaldehyde.

For example:

- ① Hercules produces both methanol and formaldehyde at its centrally located Louisiana, Missouri, plant.
- ② Delivery is made when you schedule it—where you schedule it—whether it's overnight or in three months.
- ③ All standard concentrations are available plus the full research and technical service of one of the nation's largest chemical companies to develop products or concentrations for your special needs.

For further information on how Hercules can serve your formaldehyde needs, contact your nearest Synthetics Department office or write direct to:

HERCULES POWDER COMPANY

INCORPORATED
900 Market Street, Wilmington 99, Delaware

Synthetics Department



SP60-1

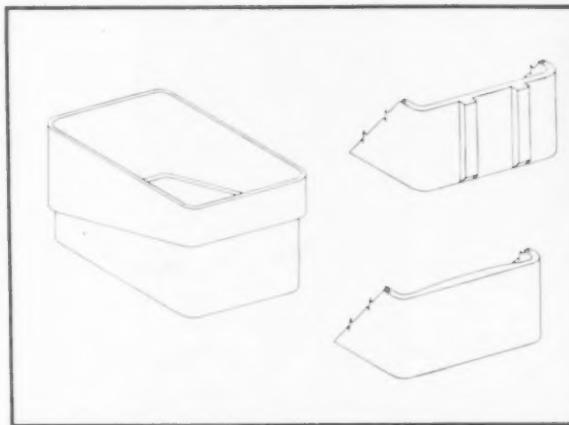


FIG. 7: Side wall designs for containers which help balance out differential shrinkages and prevent buckling of long flat sidewalls.



FIG. 8: Molded parts showing good side wall design. Notice the freedom from buckling, as is evidenced by the clean lines of the step sections.

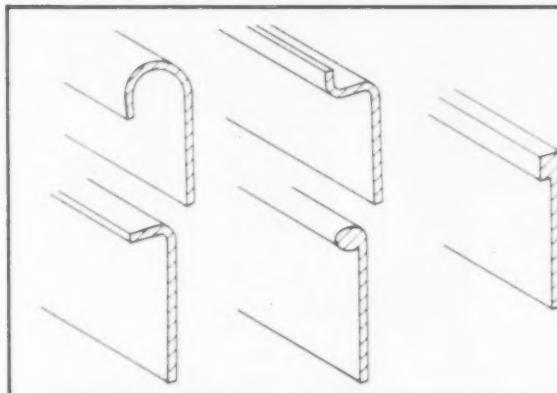


FIG. 9: Lip designs which are used to improve the rigidity of the open edges of molded parts.



FIG. 10: Molded parts showing good lip design. Parts shown are dishpan, baby bath tub, and various bowls.

part. Pyramid, crowned, or offset sections allow for strain relief without deforming other sections of the item.

It is important to use as large bottom corner radii as possible in combination with these "bottom" features. A step, or offset, is also a plus factor where it can be employed. Figure 4, p. 132, illustrates bottom corner designs in the order of preference from the standpoint of molding ease and product quality. Figures 5 and 6, p. 132, are photographs of some of the products employing these recommended features.

Side wall designs

Another important area in the design of containers or box-like items is the side wall section. Optimum quality with this type of product is achieved only when wall

sections are rigid and have shrinkage equal to that of the bottom section. Figure 7, above, illustrates the use of a stepped or thickened center sections to increase rigidity and induce the additional shrinkage that is usually needed to prevent buckling of a long flat side wall. Figure 8, above, is a photograph of items with these design features. In addition to providing rigidity to the parts, the intelligent use of the wall designs also contributes novelty to the parts' appearance as well.

Lips and edges

Inadequate rigidity in the edge or lip section of a high-density polyethylene item distracts from utility and often leads to a wavy appearance. The commonly used thick bead actually aggravates distortion problems. It (To page 207)

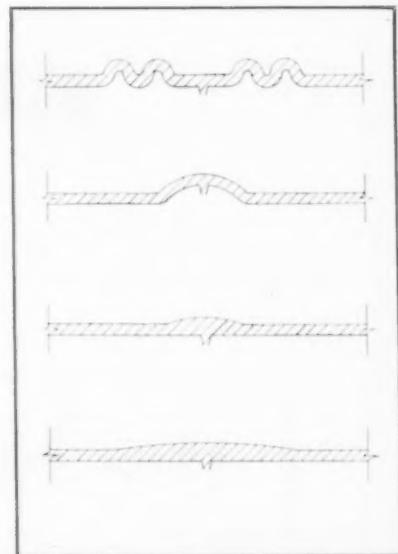


FIG. 11: Recommended part designs for the gate area of molded polyolefins.

*Turn
idle-time
into profit-time with...*



Stokes Model 744, 150-ton insert molding press . . . with
moldhalf at ejection station removed.

STOKES MODEL 744 for INSERT MOLDING

Commercially available for the first time, this new Stokes press eliminates down-time formerly needed for insert loading. Now you can load outside the press and mold inside simultaneously . . . to realize maximum efficiency.

Another first from Stokes! A unique concept of molding plastic parts with inserts takes form in the Stokes #744 Insert Molding Press. The new design incorporates a horizontal turntable which carries two identical lower mold halves. When one of these is in the normal molding position, the other is outside the press in a convenient and accessible position for loading the inserts. Result: there is never any press idle time because one mold is always producing while the other is being reloaded . . . safely and accurately.

These are some of the advantages you get *only* with the Stokes Model 744 Press . . .

- **MAXIMUM EFFICIENCY** . . . operator ejects and loads one mold while another is molding.
- **FASTER CYCLE** . . . direct result of not having to load or unload in the press . . . plus a mold opening sufficient only to clear the guide pins.
- **ONE BUTTON CONTROL** . . . a complete cycle is set into motion through the actuation of a single switch.
- **INDEPENDENT PYROMETER CONTROL** . . . one for each mold half, assures a constant, steady temperature regardless of mold position.
- **MOLD PROTECTION** . . . is assured through a low pressure close and mold position sensing device . . . plus controls for preventing transfer of material if mold is not completely closed.
- **FAST CLOSING AND PRESSING SPEED** . . . make the new Stokes press ideal for compression molding as well as transfer molding.
- **MAXIMUM FLEXIBILITY** . . . since each cylinder has its own pump and controls, pressures and speed of each can be adjusted independently.

The profit potential of this new Stokes Insert Molding Press is undoubtedly the biggest single reason you should investigate it further. Contact your local Stokes Office today for more information on this and other new developments in plastics equipment.



STOKES

Plastics Equipment Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

Remembered
for Performance...



CYMEL® MELAMINE BEETLE® UREA PLASTICS

CYANAMID MOLDING COMPOUNDS

SELF-EXTINGUISHING ■ HIGH ARC RESISTANCE ■ DEPENDABLE ELECTRIC PROPERTIES UNDER ADVERSE CONDITIONS ■ EXCELLENT ABRASION-RESISTANCE ■ CHEMICAL RESISTANCE

CYMEL 3135 — 3136 (glass-filled) Additional distinctive properties: outstanding electrical properties; high impact resistance; extraordinary flame resistance; good dimensional stability. Typical applications: circuit breaker boxes; terminal strips; connectors; coil forms; stand-off insulators. Specifications: Cymel 3135 (MMI-30, MIL-M-14E, Federal L-M-181 Type 8; ASTM D704-55T Type 8); Cymel 3136 (MIL-M-19061, MMI-5).

CYMEL 592 (asbestos-filled) Additional distinctive properties: resistance to atmospheric extremes; high dielectric strength. Typical applications: connector plugs; terminal blocks; a/c, automotive and heavy duty industrial ignition parts. Specifications: MIL-M-14E MME; Federal L-M-181 Type 2; ASTM D704-55T Type 2, SPI SPEC NO. 27025.

CYMEL 1077 (alpha cellulose-filled) Additional distinctive properties: Surface hardness, heat resistance, unlimited color range. Typical applications: appliance housings, shaver housings, business machine keys. Specifications: MIL-M-14E — Type CMG (in approved colors); Federal L-M-181 Type 1; ASTM D704-55T Type 1, SPI SPEC NO. 30026.

CYMEL 1500 (wood flour-filled) — **CYMEL 1502** (alpha cellulose-filled) Additional distinctive properties: Good insert retention. Typical applications: meter blocks, ignition parts, terminal strips. Specifications: Cymel 1500 (MIL-M-14E Type CMG, Federal L-M-181 Type 6, ASTM D704-55T Type 6); Cymel 1502 (MIL-M-14E Type CMG, Federal L-M-181 Type 7; ASTM D704-55T Type 7).

BEETLE® UREA (alpha-filled) Additional distinctive properties: Economy of fabrication, economy of material, myriad translucent and opaque colors. Typical applications: wiring devices, home circuit breakers, tube bases, appliance housings. Specifications: Federal L-P-406A, LC 726-1, ASTM D705-55, Grade 1 (Arc resistance limits are in process of revision by ASTM), SPI SPEC NO. 27026.

WRITE FOR COMPLETE TECHNICAL DATA.

CYANAMID

AMERICAN CYANAMID COMPANY • PLASTICS AND RESINS DIVISION • 30 ROCKEFELLER PLAZA — NEW YORK 20, N. Y. OFFICES IN BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • MINNEAPOLIS • NEW YORK • OAKLAND • PHILADELPHIA • ST. LOUIS • SEATTLE • IN CANADA CYANAMID OF CANADA LTD., MONTREAL AND TORONTO.



Permeability of chlorotrifluoroethylene polymers

By A. W. Myers[†], V. Tammela[†], V. Stannett[†], and M. Szwarc[†]

The permeability of a number of modifications of chlorotrifluoroethylene polymers to gases (N_2 , O_2 , and CO_2) and vapors (water and methanol) has been investigated. The effects of crystallinity, plasticization, and copolymerization with vinylidene fluoride are considered.

The transmission of a gas or vapor through a polymer takes place primarily by a diffusion controlled mechanism, wherein the gas dissolves in one surface of the film, passes through by an activated diffusion process, and evaporates from the opposite surface. The rate of permeation through the film per unit area, q , may be expressed quantitatively by Fick's first law:

$$q = -D \frac{dc}{dx} \quad \text{Eq. 1}$$

where the proportionality factor D is the diffusion constant and dc/dx is the concentration gradient across the polymer film. Under steady state conditions, and assuming that D is not concentration dependent, Equation 1 can be integrated and one obtains:

$$q = \frac{D (c_1 - c_2)}{t} \quad \text{Eq. 2}$$

where t is film thickness and c_1 and c_2 are the concentrations at the high and low pressure

surfaces, respectively. Applying Henry's law, one obtains:

$$q = \frac{DS (p_1 - p_2)}{t} \quad \text{Eq. 3}$$

where S is the solubility of a gas in cc./cc. of polymer at a pressure of 1 cm. Hg with the volume of gas corrected to S.T.P., and p_1 and p_2 are the pressures of the gas at the high pressure and low pressure surfaces, respectively.

P , the permeability constant, is defined as cc. of gas at S.T.P. permeating per second through a film of 1 cm.² area and 1 mm. thickness under a pressure difference of 1 cm. Hg and may be expressed as:

$$P = DS = \frac{tq}{p_1 - p_2} \quad \text{Eq. 4}$$

P is independent of thickness and pressure for gases. For vapors, it may increase with pressure. The temperature dependence of P may be expressed as an Arrhenius relationship, as follows:

$$P = P_0 \exp. (-E_p/RT) \quad \text{Eq. 5}$$

where E_p is the activation energy

and P_0 is the pre-exponential factor associated with the overall permeation process.

Method

The experimental method used to measure P was similar to that described by Barrer (1).¹ The

[†]Numbers in parentheses link to references at the end of article, p. 211.

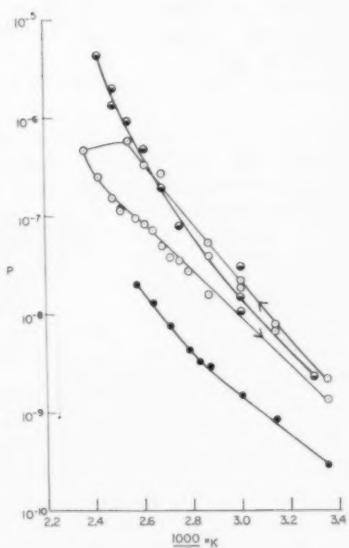


FIG. 1: Permeability of Kel-F films to water vapor (about 20 mm. Hg pressure). Legend: (○) Kel-F 300 P25 (plasticized homopolymer); (□) Kel-F 500 (copolymer containing 3% vinylidene fluoride); (●) Kel-F 300 (quenched low-crystallinity homopolymer).

Table I: Permeability of amorphous and crystalline polychlorotrifluoroethylene*

Gas	Temp., °C.	$\bar{P}, 10^{-10} \text{ cc./mm.}^2/\text{sec./cm. Hg}$	
		Amorphous	Crystalline
N_2	25	0.05	0.03
	40	0.20	0.09
	50	0.35	0.12
	60	0.63	—
	75	—	0.51
O_2	0	0.07	—
	25	0.40	—
	40	0.92	0.25
	50	1.44	0.43
	60	—	0.68
	75	5.74	—
CO_2	80	—	1.85
	40	2.11	0.48
	50	—	0.89
	60	6.12	1.37
	80	18.5	3.67

* Unplasticized Kel-F 300 films of about 30 and 80% crystallinity, respectively.

Table II: Permeability of extruded films versus crystalline and amorphous films of unplasticized Kel-F 300

Film	$\bar{P}, 10^{-10} \text{ cc./mm.}^2/\text{sec./cm. Hg}$		
	$\text{N}_2 (50^\circ \text{ C.})$	$\text{N}_2 (75^\circ \text{ C.})$	$\text{CO}_2 (75^\circ \text{ C.})$
Extruded 2 mil	0.18	0.86	5.8
Extruded 5 mil	—	0.94	6.15
Molded and annealed (~80% crystalline)	0.12	0.51	3.0
Molded and quenched (30% crystalline)	0.35	1.8	14.5

Table III: Temperature dependence of the permeability constant for chlorotrifluoroethylene polymer and copolymers

Film*	Gas	P_0	E_p	kcal./mole
Amorphous polymer	N_2	0.20	14.3	
	O_2	0.0058	11.2	
	CO_2	0.033	11.8	
Crystalline polymer	N_2	0.0014	11.9	
	O_2	0.00093	10.9	
	CO_2	0.0027	11.1	
Copolymer X-500 (3)	N_2	0.085	13.6	
	O_2	0.40	13.8	
	CO_2	0.31	13.1	
" X-800 (25)	N_2	6.75	15.5	
	CO_2	24.1	15.1	
" X-3700 (70)	N_2	1.55	13.5	
	O_2	1.25	12.8	
	CO_2	1.30	11.9	
" X-5500 (50)	O_2	3.7	13.1	
	CO_2	60	13.9	

* The figures in parentheses are the percent of vinylidene fluoride in the copolymer.

apparatus consists essentially of three parts: 1) a source of high vacuum, 2) a constant pressure source of gas or vapor under study, and 3) a diffusion cell containing the polymer film.

The film is first placed into the diffusion cell and sealed with a mercury seal. The cell is then attached to the high vacuum apparatus and the whole diffusion cell and adjoining parts are thoroughly degassed. Gas or vapor at a known pressure is then admitted to one side of the film and the gas permeates at essentially a constant pressure through the film into a receiving section where the increase in pressure with time may be recorded by a McLeod gage. When the slope of the pressure-versus-time curve remains a constant, the steady state has been reached and P may be readily calculated. Details of the equipment have been described in a number of recent publications (2,3), which should be referred to for further information.

Effect of crystallinity

Chlorotrifluoroethylene polymers may be modified in various ways, including varying the degree of crystallinity, plasticization, and copolymerization.

The effect of crystallinity was studied by preparing two samples by compression molding. One sample was quenched and was mainly amorphous; the other was carefully annealed to give a more highly crystalline film. The crystallinity of the quenched specimen was estimated to be about 30% and that of the annealed to be 80 percent. The permeability values were measured and are tabulated in Table I, above, where it can be readily seen that a sharp reduction in the permeability constant results from crystallization of the material.

This same behavior has been found with other polymers, such as polyethylene. Undoubtedly, the main contribution to the gas permeation comes from the amorphous regions, with the crystalline regions generally being impermeable. Thus, increasing the crystallinity from about 30 to 80% reduces the permeability constant to almost one-third of the original value, or approxi-

**MORE
AND
MORE
INjec-
TION
MOLDERS
ARE IN-
CREASING
PROD-
UCTION**

WITH THE

DE MATTIA

**12/16 OZ
MODEL**

M-1



Fully hydraulic, completely automatic (with prepack), 12 dry cycles per minute, low pressure closing . . . these and the many other features of the De Mattia 12/16 oz. Model M-1 add up to proven production increases of up to 20 per cent. Write for complete details, specifications.

PLASTICIZING CAPACITY	150 lbs./hr.
MAXIMUM DAYLIGHT	32"
CLAMPING PRESSURE	400 tons
MAXIMUM MOLD SIZE	20" x 30" horiz. 16" x 32" vert.

DE MATTIA MACHINE & TOOL CO. • Main Office and Plant: CLIFTON, N. J.
Sales Representatives: ACME MACHINERY & MANUFACTURING CO., INC., 20 South Broadway, YONKERS, N.Y.; 102 Grove Street, WORCESTER, MASS.; BROSITES MACHINE CO., INC., 50 Church Street, NEW YORK 7

Table IV: Effect of plasticizer on permeability of polychlorotrifluoroethylene

Gas	Temp., °C.	$P, 10^{-10} \text{ cc./mm.}^2/\text{sec./cm. Hg}$	
		Unplasticized	Plasticized ^a
N_2	50	0.18	5.5
	75	0.86	25.7
O_2	0	0.04	1.1
	30	0.52	5.6
CO_2	60	2.90	28.0
	50	3.7	75.0

^a Plasticizer was low molecular weight polychlorotrifluoroethylene.

Table V: Permeability of chlorotrifluoroethylene copolymers^a

Gas	Temp., °C.	$P, 10^{-10} \text{ cc./mm.}^2/\text{sec./cm. Hg}$			
		X-500 (3)	X-800 (25)	X-5500 (50)	X-3700 (70)
N_2	0	—	0.029	—	0.25
	12.5	—	—	—	—
	25	0.11	0.30	—	1.62
	50	0.52	2.34	—	12.7
	75	2.92	13.1	—	56.2
O_2	0	—	—	1.11	0.62
	12.5	—	—	3.74	—
	25	0.20	—	9.34	5.46
	40	1.18	—	—	—
	50	2.05	—	50.5	34.1
	75	7.73	—	—	111
CO_2	0	0.10	0.19	—	2.73
	25	0.80	1.83	39.8	27.2
	50	5.25	15.2	248	137
	75	19.5	70.8	—	440

^a The figures in parentheses are the percent of vinylidene fluoride in the copolymer.

Table VI: Permeability of polychlorotrifluoroethylene to water and methanol vapors (amorphous unplasticized Kel-F 300)

Vapor	Temp., °C.	$P, 10^{-9} \text{ cc./mm.}^2/\text{sec./cm. Hg}$
Water (~20.5 mm. pressure)	25	0.29
	45	0.85
	60	1.5
	75	2.8
	80	3.3
	85	4.3
	95	7.6
	105	13.0
	115	20.0
Methanol (~50 mm. pressure)	60	0.81
	67	1.4
	75	2.4
	85	5.1
	95	8.7
	105	9.1
	115	9.4
Permeability recorded after a run at 115° C.	67	0.62

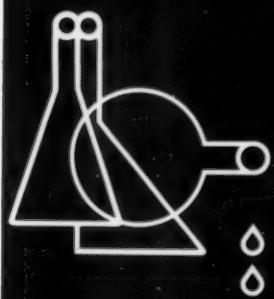
mately in line with the decrease in the amorphous content. A more complete discussion on the effect of crystallinity on gas and vapor permeability is given in References 4 and 5.

The degree of crystallinity and the gas permeability of commercial films will depend on the heat treatment accorded them in processing. Values for two typical extruded films are shown in Table II, p. 140, compared with the corresponding values for the quenched and annealed films. It can be seen that intermediate values are obtained but closer to the values obtained with the more highly crystalline film.

The temperature dependence of the permeability constant for N_2 , O_2 , and CO_2 transmission through polychlorotrifluoroethylene polymers is shown in Table III, p. 140. There is little change in solubility with "real" gases at the temperature range investigated; the main contribution to the activation energy of permeation is the activation energy of diffusion. The activation energy for diffusion may be thought of as the energy needed to separate the polymer molecules sufficiently to allow the gas molecule to move between and is principally a result of thermal motion of the polymer molecules. Thus, activation energies for diffusion can be classed according to the molecular diameter (6). It can be seen from experimental data that oxygen (molecular diameter 2.98 Å.) has a lower energy of permeation than nitrogen (molecular diameter 3.18 Å.) for the same material. The activation energy for diffusion also increases with, for example, increasing cohesive energy of the polymer and, therefore, diffusion rates will be dependent on the polymer. The high polarity and cohesive energy of Kel-F films results in high energies of permeation. A further discussion of the temperature dependence is given in the copolymers section.

Effect of plasticization

The effect of plasticizer on the permeability constant of polychlorotrifluoroethylene polymers is shown in Table IV, above, where it can be seen that the plasticized film is many times more perme-



Colors
for plastics
and
organic coatings

C I B A

CIBA Company Inc.
Fair Lawn,
New Jersey
Route 208
Swarthmore 1-1122

District Offices:

Charlotte 6,
North Carolina
1517 Hutchinson Ave.
Edison 2-3181

Philadelphia 40,
Pennsylvania
4241 North 2nd Street
Gladstone 5-5507

Rumford 16,
Rhode Island
321 North Broadway
Genava 4-2422

Los Angeles 23,
California
3390 East Olympic Bd.
Angelus 9-2169

Skokie, Illinois
7835 Lincoln Avenue
Juniper 8-3941

CIBA, for decades in the forefront of
technical development and high-quality production
in the field of dyes,
pharmaceuticals and plastics,
now also

**produces organic pigments
for
the plastics and
organic coating industries.**

**Colors
for plastics
and
organic coatings**

C I B A

able than the unplasticized. The permeabilities of plasticized and unplasticized Kel-F² films to hydrogen and carbon dioxide at a number of temperatures have been reported by Brubaker and Kammermeyer (7). Similar large increases in the permeability constants with plasticization were found. In an earlier publication (8), the permeability constants of Trithene³ B for various gases and temperatures were reported. We want to clearly point out that those results were for the plasticized film and thus gave understandably higher results compared to the unplasticized film as shown in Table IV. Undoubtedly,

² Trademark of Minnesota Mining & Mfg. Co.
³ Trademark of Viking Co., div. of Union Carbide Corp.

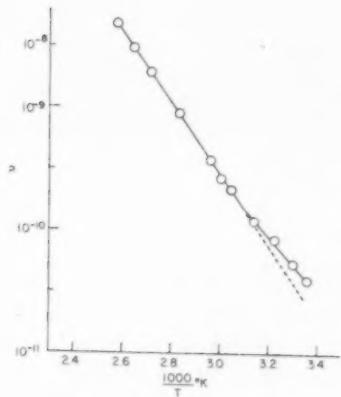


FIG. 2: Permeability of Kel-F 300 (quenched low-crystallinity homopolymer) to carbon dioxide.

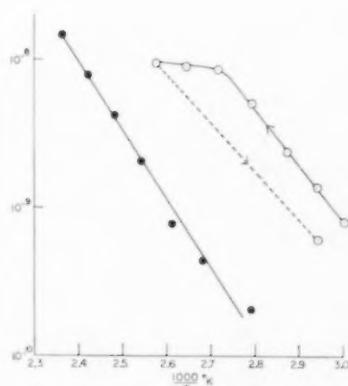


FIG. 3: Permeability of Kel-F films to methanol. Legend: ○—Kel-F 300, quenched (50 mm. Hg methanol pressure); ●—Kel-F 500 (100 mm. Hg methanol pressure).

the increase in permeability for the plasticized film is mainly due to an increase in the diffusion constant. The solubility of permanent gases is not believed to be greatly affected by plasticization. The plasticizer reduces the cohesive forces giving rise to easier penetration by the diffusing species. This is reflected in both the larger diffusion constant and the lower energy of activation for the overall permeation process. A further discussion on the effects of plasticizers on gas and vapor permeability may be found in References 2 and 9.

Copolymerization

A series of chlorotrifluoroethylene copolymer films were prepared and their permeabilities measured. These results and the approximate composition of the copolymers are shown in Table V, p. 142.

All the copolymers have higher gas permeability constants than even the amorphous homopolymer. This would be anticipated, since copolymerization provides internal plasticization allowing easier diffusion of the penetrant gas or vapor. Furthermore, the solubility will increase as the crystallinity decreases due to copolymerization. As the percentage of the copolymer is increased beyond about 50%, the permeability constant begins to decrease again. This type of be-

havior is characteristic of a range of copolymers, although complicated in this case since both monomers alone lead to crystalline polymers.

The temperature dependencies of the various copolymers, together with those found for amorphous and crystalline poly-chlorotrifluoroethylene, are given for the permanent gases in Table III. No clear pattern in the values can be seen in the activation energies, although somewhat larger values are obtained with the copolymer. It should be pointed out, however, that with highly impermeable films such as these, the experimental error is enough to mask the expected differences in the activation energies. Differences in the pre-exponential factors are more striking and reflect, to some extent, the openness of the polymer structure. Thus, P_0 values for the amorphous homopolymer are more than 100 times those of the crystalline sample. Increasing copolymerization first increases P_0 and then begins to decrease it, presumably towards the value of the homopolymer of the co-monomer.

Water and methanol permeabilities

The permeabilities of a number of Kel-F polymers to water vapor are shown in Table VI, p. 142. The method used for measuring these values has been (To page 211)

Table VII: Permeability of plastics films to water vapor (25° C.) and to gases (30° C.)

Material	P, 10 ⁻¹⁰ cc./cm. ² /sec./mm./cm. Hg			
	H ₂ O	N ₂	O ₂	CO ₂
Kel-F 300 (unplasticized)	<2.9 ^a	0.03	0.10	0.72
Saran	10.0	0.0094	0.053	0.29
Polyethylene terephthalate (Mylar A)	1,300	0.05	0.22	1.53
Rubber hydrochloride, unplasticized (Pliofilm NO)	260	0.08	0.30	1.7
Nylon 6	1,770	0.10	0.38	1.6
Polyvinyl chloride (unplasticized)	1,560	0.4	1.2	10
Polyethylene (0.953 density)	160	3.3	11.0	43
Butyl rubber	—	3.1	13.0	52
Cellulose acetate (plasticized)	68,000	2.8	7.0	68
Polyethylene (0.938 density)	298	6.6	21	74
Polystyrene	12,000	2.9	11	88
Rubber hydrochloride, plasticized (Pliofilm P-4)	—	6.2	24	182
Polyethylene (0.922 density)	1,000	22	69	280

^a On quenched low-crystallinity sample, lower values are obtained with annealed films.

New Housing Projects, 1960 Style

**Product builders achieve significant improvements with
Pro-fax® polypropylene**

BULLETIN

WASHINGTON, D. C. . . . The Food & Drug Administration has issued a formal regulation, appearing in the Federal Register, authorizing the use of Pro-fax polypropylene in products coming in direct contact with all kinds of food. Pro-fax thus becomes the first packaging material to win approval through the issuance of a formal Food Additives regulation. Author of the successful petition was Hercules Powder Company. Hercules predicts widespread use of Pro-fax in food uses, including packaging films, molded containers, coatings, liners and dispensers used in food handling.

Plastic housings in all manner of sizes and shapes, used in an across-the-board list of products, are among the first big developments of the

'60s . . . an exciting clue to things ahead. Materials such as Pro-fax polypropylene are fast changing the face and function of many a product, lending new color and styling appeal, improved performance, and above all—*lower cost!*

Measured by yesterday's standards the achievements of today's new materials border on the impossible: they provide high resistance to heat, moisture, household chemicals, foods and cosmetics. They offer rich color and are ideally adapted to the attractive styling requisite for modern merchandising. Yet because they are low-cost materials, adaptable to rapid cycle injection-molding, they are *priced right!*

No wonder that just about every new plastic housing project you see these days is a Pro-fax project. Here are a few of the latest.



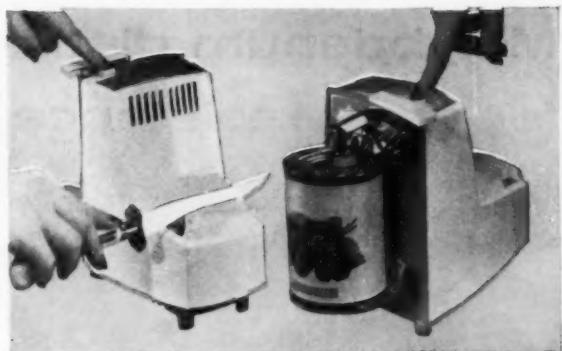
AROUND THE YARD

A handsome Pro-fax housing is the new symbol of quality on today's modern power mower. An excellent example is this high-styled motor shroud for the 1960 Power-Matic. Its beauty belies its rugged strength, for this sturdy housing is virtually unbreakable and will permanently resist heat, moisture, gasoline, oils and greases. Molded-in mountings eliminate the need for metal parts in the assembly, providing a design that is completely corrosion-proof. In addition to the Power-Matic shroud, Amos Molded Plastics, Edinburg, Indiana, has designed, developed and produced a series of similarly well-engineered Pro-fax mower housings for Power Equipment, Cicero, Indiana, and its value-conscious customers.

IN THE KITCHEN

Pro-fax in the kitchen spells new convenience and satisfaction for homemakers. Knapp-Monarch's Redi-Matic automatic can opener-knife sharpener features a gleaming white Pro-fax housing, and as a result is impervious to damage from staining and rough handling. The Redi-Matic automatically opens cans of all shapes, and sharpens knives of all sizes. Thanks to Pro-fax, it's a luxury styled unit designed to blend beautifully with any kitchen decor.

Molded by: Warren Molded Plastics, Cortland, Ohio.



IN THE NURSERY

Modern style and top performance go hand in hand in Formulette's bottle warmer. It's molded with Pro-fax, of course, for a luxury finish plus resistance to heat and moisture, in a rigid, thin-walled, lightweight unit that is easy to handle, always safe and the ultimate in completely sanitary nursery equipment.

Molded by Boonton Molding Company, Boonton, New Jersey, for Formulette Company, Inc., Jamaica, New York.

ABOUT THE HOUSE

Fast becoming standard home accessories, vaporizers and humidifiers have gotten a big boost in appearance and function by the use of Pro-fax. The new Northern automatic vaporizer/humidifier (shown here) features a bowl and lid molded with Pro-fax, in contrasting colors, which combine in a compact, easy-to-carry appliance that is both useful and attractive wherever it serves in the house.

Pro-fax bowl and lid molded by Cruver Manufacturing Company, Chicago, Illinois.



IN THE LUNCH BOX

Breadwinners, too, enjoy the convenience and luxury of Pro-fax. The handle, jacket, and collar of Aladdin's new Dura-Clad vacuum bottle, with its unique "Pitcher-Pour" handle, are all molded in one piece with Pro-fax. Pint-size (shown here in use) fits all workmen's lunch kits while the quart size (appearing in the background) is designed to fit conventional outing kits. Both models are heat-, scratch-, and stain-proof.



HERCULES POWDER COMPANY

INCORPORATED
900 Market Street, Wilmington 99, Delaware

CP60-9

THREE NEW MATERIALS FOR THE PLASTIC INDUSTRY

HI-FAX® HIGH-DENSITY POLYETHYLENE • PRO-FAX® POLYPROPYLENE • PENTON® CHLORINATED POLYETHER

Molybdenum disulfide in nylon for wear resistance

By Thomas E. Powers*

Designers and molders alike are finding that nylon plastic containing controlled amounts of molybdenum disulfide homogeneously dispersed is capable of producing parts having superior wear resistance at lower costs. Injection molded parts have better wear and abrasion resistance, lower coefficients of friction, and better dimensional stability than parts made of conventional nylon. Molders report faster molding cycles, less shrinkage and distortion, easier ejection, and reduced mold lubrication, all of which tend to cut molding costs.

The addition of precise amounts of molybdenum disulfide to nylon improves a wide range of characteristics which, in combination, add up to decidedly superior performance and extend the usefulness of industrial plastic components. The improvement is not unexpected since molybdenum disulfide (MoS_2 or moly-sulfide) has been shown by tests to be one of the best solid lubricants. According to figures from press fit tests, natural MoS_2 has a kinetic coefficient of friction one-third that of the next best lubricant.

Design advantages

Design men are interested, naturally, in the end results of the addition of molybdenum-disulfide to nylon. One of the best ways to indicate these results is by comparison with conventional type 6/6 nylon. Physical properties of the MoS_2 -nylon combination, called Nylatron¹ GS, are listed in Table I, p. 150, and comparative wear rates are illustrated in Fig. 1, right. These improved key properties produce some outstanding results when translated into actual part design.

Greater wear. Gears, wear

* Molding Resins Div., The Polymer Corp., Reading, Pa.

¹ Trademark of The Polymer Corp.

strips, and bearings have outworn standard nylon parts by 2 to 1. The test data in Fig. 1 show that the wear rate for the GS-nylon is approximately half that of nylon-6/6. For example, in nonlubricated thrust bearing shoe parts used in motor stairs equipment, GS-nylon outwore standard nylon over 3 to 1, while drive gears molded of GS-nylon for household portable mixers increased the wear life of the gears between 70 and 100 per cent.

The abrasion resistance of nylon-6/6 is well known and applications utilizing the material under wear conditions are numerous. The GS-nylon exhibits even superior abrasion resistance and wear characteristics. As a dry bearing, it can be used at PV (pressure-velocity) ratings as much as 50% higher than nylon-6/6 because nylon with molybdenum disulfide runs cooler, smoother, and quieter with less friction to generate heat; maintains established fits and running clearances over a greater temperature range; and is harder and stiffer than ordinary nylon.

GS-nylon parts can often replace metal components where high wear is a problem. In one instance, metallic actuating levers, cams, and bearing blocks used in a 500-v., 150-amp. switch had to be replaced after only 500,000 to 600,000 cycles. Since GS-nylon has been used, test switches have been cycled more than 18,000,000 times without a failure.

Dimensional stability. Many applications for mechanical and electrical wear parts require extremely close tolerances and a high degree of dimensional stability. One such part is the "card pusher" slide used in a new IBM 88 punched card collator. (Fig. 2, p. 153). Fabricated nylon-6/6 was used for this part in the develop-

ment period, but it was necessary to lubricate the long 5-in. tracks. Use of lubricant caused dust accumulation and consequent poor operation of the slides. No surface lubricant is now necessary with GS-nylon. Dimensional stability is essential and the part exhibits no warpage despite the range in wall thickness from $\frac{1}{8}$ to $\frac{1}{16}$ inch.

Shrinkage and warpage are tied so closely to internal stress that it is necessary to consider their combined influence. Nylon with MoS_2 shrinks less and more uniformly than conventional nylon in any given section. Its coefficient of linear thermal expansion (as shown in Table I) is approximately 40% less. This provides better size control as well as more accurate molding tolerances.

Coupled with reduced shrinkage is a marked reduction in internal stresses. All molded parts have some built-in stress, but

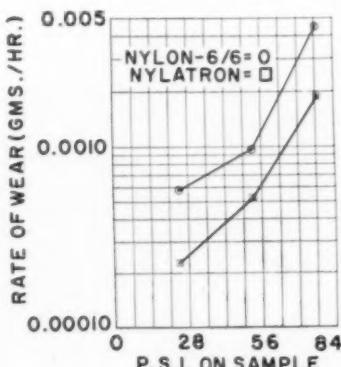
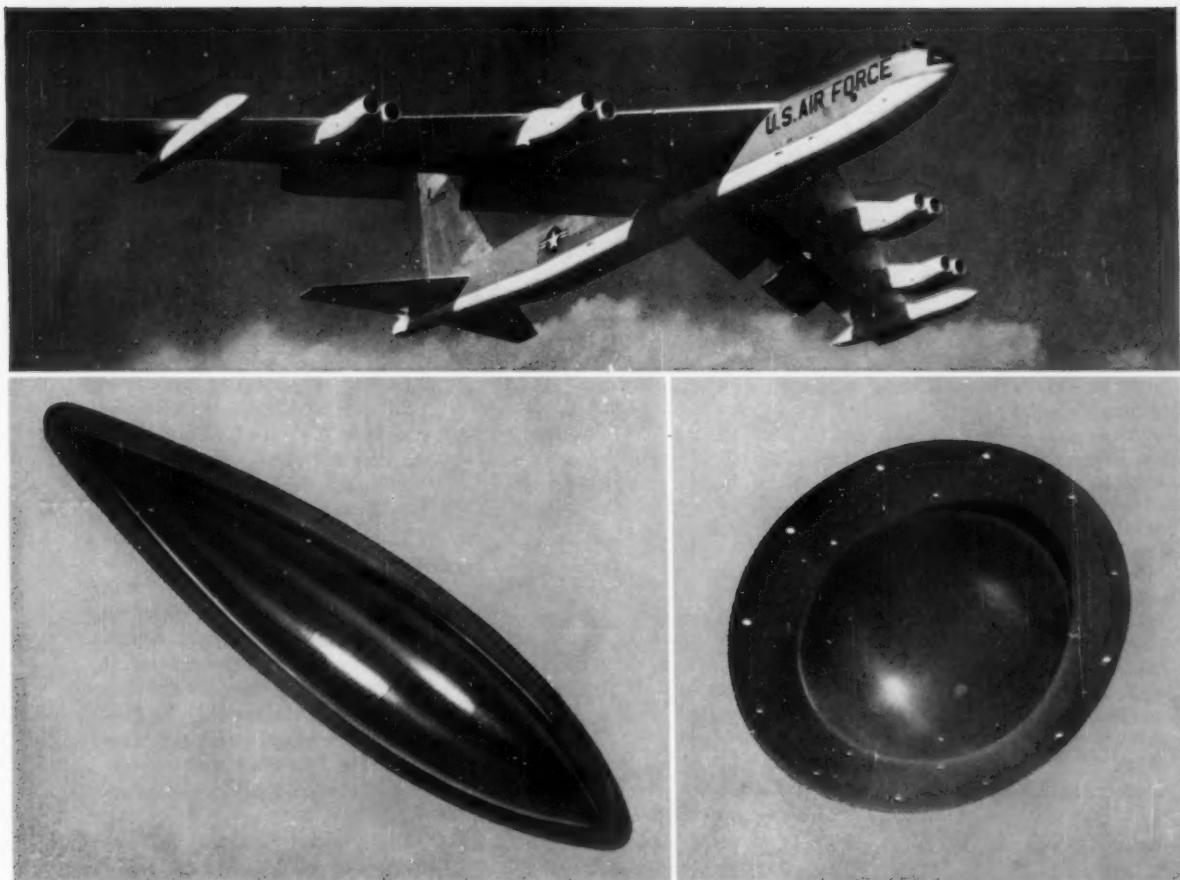


FIG. 1: Accelerated wear tests made to indicate relative rates of wear between moly-filled and unfilled nylon. Both specimens were run against steel cleaned with carbon tetrachloride. Rubbing velocity 1165 revolutions per minute. (160 linear ft./min.). Surfaces were not lubricated.

Naugatuck VIBRIN



B-52 antenna covers of **VIBRIN®**... to .003 of an inch tolerances!

Workmanship to three-thousandths of an inch is close for plastics. And such excellent workability is but one of the requisites for these fiber-glass-reinforced polyester parts made by Boeing.

Thermal stability is a must...to withstand the searing temperatures resulting from high speeds, from rocket and jet exhausts. And VIBRIN 136-A is one of only two resins which have met the Military Specifications (R-25042) for such applications. (The other is VIBRIN 135.)

Not only does VIBRIN answer the needs of precision formability and stability at temperatures of well over 500°F, but it is transparent to radio and radar waves as

well. It thus offers excellent protection to these vital military "eyes and ears" without in any way interfering with their function.

Now being used for a wide variety of lightweight aircraft and missile parts, ranging from these to the nose cone of the BOMARC missile, VIBRIN, in one of its many task-tailored forms, may be precisely the material your product requires...to make it work, work better, work for less, or sell more.

For more information on the properties and uses of this exceptionally light, strong, and easy-to-mold material... for technical assistance with your own application, see your Naugatuck Representative or write the address below.



United States Rubber
Naugatuck Chemical Division

615V ELM STREET
NAUGATUCK, CONNECTICUT

KRALASTIC RUBBER-RESINS • MARVINOL VINYL • VIBRIN POLYESTERS

Akron • Boston • Chicago • Gastonia • Los Angeles • Memphis • New York • Phila. • CANADA: Naugatuck Chemicals • Elmira, Ont. • Cable: Rubexport, N.Y.

GS-nylon parts have decidedly lower stress due to their high degree of crystallinity. The different characteristics exhibited by the amorphous layer and the more crystalline body of a standard nylon molded part are a prime source of internal stress. The lack of uniformity in the structure of these layers and/or a predomi-

nance of the amorphous layer imparts a high degree of stress to the molding. The result is nonuniform shrinkage or *warpage*.

In heavy sections, most of the volume of the material has a crystalline make-up; therefore, it is the properties of this crystalline make-up that predominate. As thinner sections are molded, the

outer layers of amorphous structure constitute a greater percentage of the entire part, and dimensional change (*warpage*) produced by internal stresses after the molding operation are more pronounced.

The results of tests on a thin disk (Fig. 3, p. 153) molded under the conditions reported in Table II, below, illustrate the decreased shrinkage and warpage obtained with the GS-nylon. Measurements were taken from the peak in the curvature of each disk to the surface of a flat plate. As indicated by the dimensions, the disk is designed with a slight curvature. Ordinary nylon measured 0.557 in., whereas GS-nylon measured 0.217 inch. Thus, from the nominal dimension of $\frac{5}{32}$ in., the regular nylon warped more than six times as much.

The other major factor influencing dimensional stability is moisture absorption. As with other nylons, GS-nylon picks up moisture until equilibrium condition are reached. This will result in an increase in the part size, but the new composition absorbs 25% less moisture than nylon-6/6. This is important for parts such as submerged pump impellers (as shown in Fig. 4, p. 154).

These impellers, molded of nylon containing moly-disulfide, are more efficient, last longer, and are less expensive than impellers made from either ordinary nylon or brass. Impeller efficiency is higher due to improved smoothness of the water passages. The part in operation is completely submerged, but there is no prob-

Table I: Comparison of physical properties of Nylatron GS and nylon-6/6

Property ^a	ASTM Method	Nylatron GS	Nylon-6/6
Tensile strength at 73° F., p.s.i.	D638-52T	12,300	11,800
Modulus of elasticity at 73° F., p.s.i.	D638-52T	575,000	400,000
Flexural strength at 73° F., p.s.i.	D790-49T	18,000	13,800
Izod impact strength at 73° F., ft.-lb./in. of notch	D256-54T	0.62	0.94
Heat distortion temp., 264 p.s.i. load, °F.	D648-45T	325	200
Coefficient of linear expansion, in./in./°F.	D696-44T	3.5×10^{-5}	5.5×10^{-5}
Dielectric strength (short-time), v./mil	D149-55T	356	385
Specific gravity	D797-48T	1.16	1.14
Water absorption ^b	D570-42		
24 hr., %		0.80	1.10
48 hr., %		1.14	1.48
Flammability, in./min.	D635-44	Self-extinguishing	Self-extinguishing
Color		Gray to black metallic	Buff white
Tensile impact*, ft.-lb./sq. in.	—	118	137
Deformation under load, %	D621-51	0.8	1.0
Brittleness temperature, °C.	D746-55T	-15	-30
Kinetic coefficient of friction versus steel	—	0.16 to 0.2	0.2 to 0.3

^a The values given are average values and should not be used for specification purposes. The data for Nylatron GS were obtained using annealed test specimens.

^b Specimens were $\frac{1}{2}$ in. in diameter and $\frac{1}{8}$ in. thick.

— C. G. Bragaw, MODERN PLASTICS 33, 199-203, 206 (June 1956).

Table II: Comparative molding conditions and shrinkage (in inch per inch) for parts molded of nylon-6/6 and Nylatron GS

Part and material	Injection temperature			Injection cycle			Injection pressure p.s.i.	Shrinkage in./in.
	Rear °F.	Front °F.	Nozzle °F.	Plunger sec.	Die close sec.	Unloading time sec.		
Disk (Fig. 3)								
Nylon 6/6	675	610	615	11	12	5	1000	0.021
Nylatron GS	690	630	635	10	8	4	1000	0.007
Flare nut (Fig. 5)								
Nylon 6/6	570	515	535	5	5	0	1000	0.011
Nylatron GS	570	545	550	5	3	0	1000	0.006
Bearing block (Fig. 6)								
Nylon 6/6	600	550	560	10	6	3	800	0.032
Nylatron GS	520	480	490	7	3	3	1000	0.028

WITCO CHEMICALS- BUILDING BLOCKS FOR FINE PLASTICS



Producing better plastics is child's play with Witco's line of chemicals for the plastics industry. Manufactured under strict production control, Witco chemicals offer uniformly high quality and outstanding performance.



WITCO CHEMICAL COMPANY, Inc.

122 East 42nd Street, New York 17, N.Y.

To order, call your nearest Witco sales office. Sales Offices in Chicago • Quincy-Boston • Akron • Atlanta • Houston • Los Angeles • San Francisco • Toronto and Montreal, Canada • London and Manchester, England • Glasgow, Scotland • Rotterdam, Holland • Paris, France



NOW IN AMPLE SUPPLY

NADIC® Methyl Anhydride

Liquid Epoxy Curing Agent with 6 Big Practical Advantages

New production capacity makes National Nadic Methyl Anhydride amply available at an attractive price. Already widely used by many of the most-experienced epoxy resin formulators, this effective curing agent has these 6 big advantages:

1. Ease of handling because it is a clear, colorless, low-viscosity liquid that is very easily mixed with liquid epoxies at, or slightly above, room temperature.
2. Light-colored clear castings.
3. Longer pot life of catalyzed resins—shelf life in molding composites as much as two months without activator!

4. Lower volatility during cure, lower peak exotherms and greater control of cure at moderate initiating and post-cure temperatures.
5. Excellent thermal stability of cured resins due to high heat-distortion temperature imparted by this unique curing agent.
6. Greater latitude in formulations both for required heat distortion temperature and hardness of finished casting.

TECHNICAL DATA AND SAMPLE AVAILABLE NOW

Write today for Technical Data Sheet 61159D, working sample and quotation on Nadic Methyl Anhydride — the preferred epoxy curing agent.

NATIONAL ANILINE DIVISION

40 RECTOR STREET, NEW YORK 6, N. Y.

Atlanta Boston Charlotte Chicago Greenboro Los Angeles

Philadelphia Portland, Ore. Providence San Francisco

In Canada: ALLIED CHEMICAL CANADA, LTD., 100 North Queen St., Toronto 1B

Distributors throughout the world. For information:

ALLIED CHEMICAL INTERNATIONAL • 40 Rector St., New York 6, N. Y.



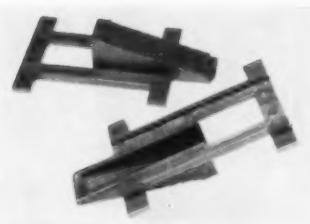


FIG. 2: Extreme dimensional stability is exhibited by this Nylatron GS card pusher slide. The part exhibits no warpage, despite wall thickness variation that ranges from $\frac{1}{8}$ to $\frac{9}{16}$ inch.

lent of distortion since GS-nylon exhibits less expansion due to moisture absorption than nylon-6/6.

Heat distortion. Advantage was taken of the resistance to heat distortion of moly-disulfide with filled nylon to obtain a 10 to 20% savings by redesign of a Westinghouse oven door assembly. Heat tests conducted on the material showed that it resisted heat much better than standard nylon. GS-nylon resisted distortion at temperatures up to 325° F. under a point-contact 13-lb. load. Wear tests indicated that in this particular application, the parts wore twice as long as ordinary nylon moldings. In typical molded parts MoS₂-nylon composition deforms 20% less under load at room temperature than standard nylons, as shown in Table I.

Other properties. GS-nylon is unaffected by alkalies and most solvents, including hydrocarbons. Electrically, it has excellent insulating properties, a low dielectric constant, and a relatively high dielectric strength. Additionally, the properties of GS-nylon moldings are more nearly equivalent to those of prototypes machined from stock shapes than are ordinary nylon parts; this is a distinct advantage for both part as well as mold design.

Molding advantages

Most of the cost advantages with the moly-disulfide additive come from better molding properties that permit economies in the production of wear parts. These economies are of prime concern to the designer. In general, the improved properties of GS-nylon

should be available to designers at no more, and often at less cost than regular nylon parts.

GS-nylon is readily molded on standard injection molding equipment, but mold cycles are commonly faster. The mold cycles (Table II) for the parts illustrated in Figs. 5 and 6, p. 154, are from 20 to 33% faster for GS-nylon than for nylon-6/6. The die closure time is shorter for both parts; the plunger cycle is less for the bearing block.

Less scrap is encountered. The inherent lubricity of molybdenum-disulfide makes it possible to remove the threaded core pins from the flare nuts with very little scrap. Regular nylon seized on the core pins, causing time-consuming interruptions of the cycle for part removal.

Mold lubrication is reduced and frequently eliminated entirely. The bearing block shown in Fig. 6 had a tendency to stick in the stationary half of the mold when conventional nylon was used. This was caused by flashing of material at points where core pins were made to "kiss off" or butt together to form a seal. Because of this sticking, it was necessary to lubricate the mold every few shots. With GS-nylon, however, the flashing has been completely eliminated so that very little lubrication is necessary.

Crystallinity

The advantages of greater wear and lower coefficient of friction are contributed by the lubricating qualities of moly-disulfide. But the contribution of molybdenum disulfide to raising the heat distortion temperature, increasing flexural strength and elastic modulus, and improving dimensional stability comes from an entirely different characteristic, in other words, greater crystallinity.

With ordinary nylon, injection

molded parts have relatively low, nonuniform crystallinity. The rapid cooling (quenching) experienced by the molten nylon as it contacts the mold surface produces an almost completely amorphous (noncrystalline) layer or skin. This outer layer does not have optimum bearing qualities and, therefore, it is frequently necessary to lubricate ordinary nylon molded parts.

There is considerable difference in structure between the outer layer and the body of a conventional nylon part. Inherently, the part is less rigid and a high degree of stress is molded into the part.

To demonstrate the reason why GS-nylon has improved properties over ordinary nylon moldings, the extremely thin section disk (Fig. 3) was molded in both GS-nylon and nylon-6/6 materials, using the same equipment. The representative samples used in this test comparison were taken from parts molded with the fastest cycle time of each resin. Approximately eight months after injection molding the disk, several size comparisons were made, along with the photomicrographs (Fig. 7, p. 154) showing the crystalline structure of the parts.

Structure comparisons. In Fig. 7A, the right hand third (the lighter area) of the nylon-6/6 piece is almost entirely amorphous. The middle third has striations of crystallinity (shown as darker streaks) making up $\frac{1}{3}$ to $\frac{1}{2}$ its area. The left hand third at the base of the sample is essentially all crystalline except for the amorphous edges.

On the other hand, the GS-nylon part (Fig. 7B) displays full crystallinity even to the tip of the disk. The solid gray color of the piece is caused by its very fine, even crystalline structure. The amorphous skin on the GS-nylon part is very thin but, more impor-

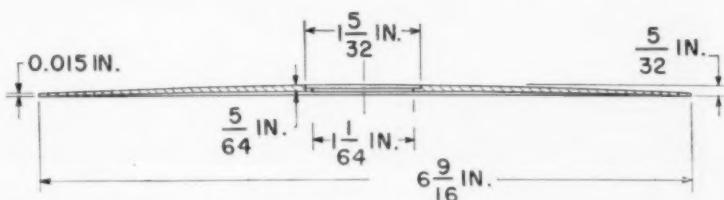


FIG. 3: Dimensions of thin disk used in warpage test.

tantly, it is uniform. Since the part is mostly crystalline, less over-all shrinkage occurs.

Although it was not possible to obtain a strictly quantitative comparison of thickness of the amorphous skin on the two specimens, the GS-nylon had a uniform skin slightly less than 1 mil in thickness, whereas the skin on the nylon-6/6 part varied from 3 to 4 mils in thickness. Standard nylon, therefore, had a 75% greater content of amorphous material with over four times the variability in structure (nonuni-

formity) compared to GS-nylon. It is important to note at this point that by keeping the amorphous layer at a minimum thickness, the bearing qualities that are contributed by the MoS_2 additives are more fully utilized.

Size comparisons. After over eight months' aging at room temperature, a size comparison shows that the nylon-6/6 part is much thicker, especially at the tip. In this molding, GS-nylon grew far less after molding, resulting in a piece that is both thinner and more uniform. To show this more accu-



FIG. 4: This two-piece impeller shows the accuracy of parts molded from Nylatron GS. The two parts are sitting lightly together for photographic purposes. At assembly, the two pieces will be pressed together and their mating line on the impeller vein (as shown by arrow) will present a smooth surface.

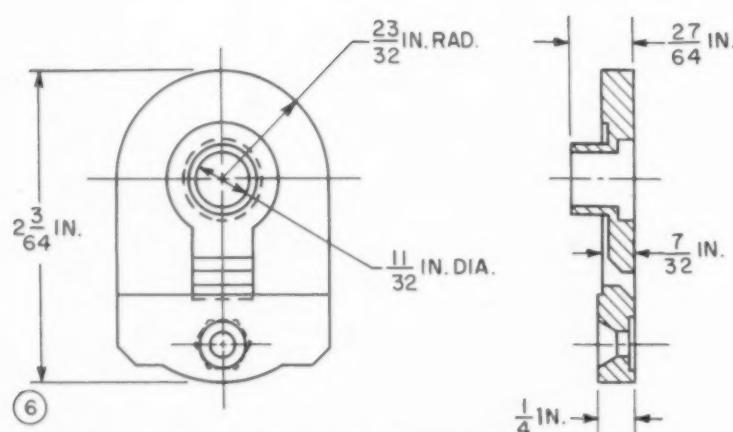
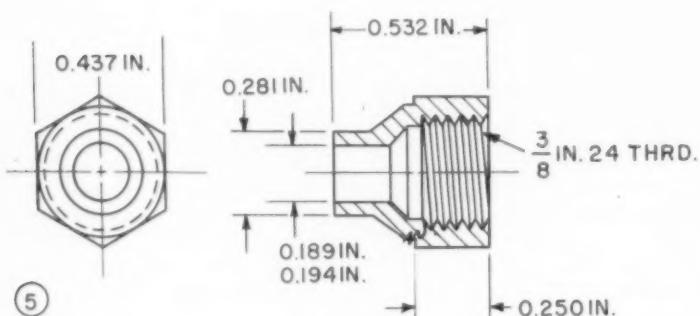


FIG. 5: Dimensions of flare nut used in comparison of molding cycles and shrinkage. **FIG. 6:** Dimensions of bearing block used in comparison of molding cycles and shrinkage.

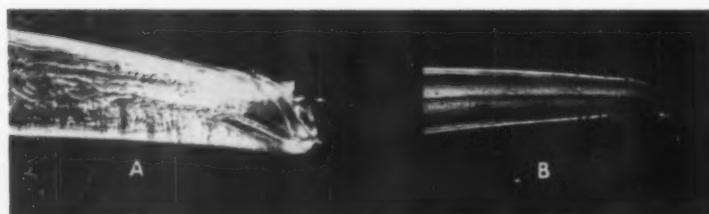


FIG. 7: Microphotographs show the crystalline structure of thin sections molded from nylon-6/6 (A) and Nylatron GS (B). Magnification of the sections is 52 times actual size.

rately, 16 equally spaced points around the tapered edge were carefully measured. The mold design included a 1 or 2 mil ridge $\frac{1}{32}$ in. back from the edge. The average micrometer readings at the spaced portions on the ridge showed 30 mils for GS-nylon with an 8-mil spread, and 39 mils for nylon-6/6 with a 14-mil spread. Again, in this case, conventional nylon had 30% more hygroscopic expansion and 75% more variation in dimensions than did the GS-nylon. The rate of moisture absorption is, likewise, dependent upon crystallinity.

Generally, crystallinity in nylon promotes practically all of its desirable properties, including the degree of similarity between molded and machined parts. Thus, the improvements in GS-nylon over ordinary nylon exists primarily by virtue of the molybdenum sulfide that is found in the patented formulation.

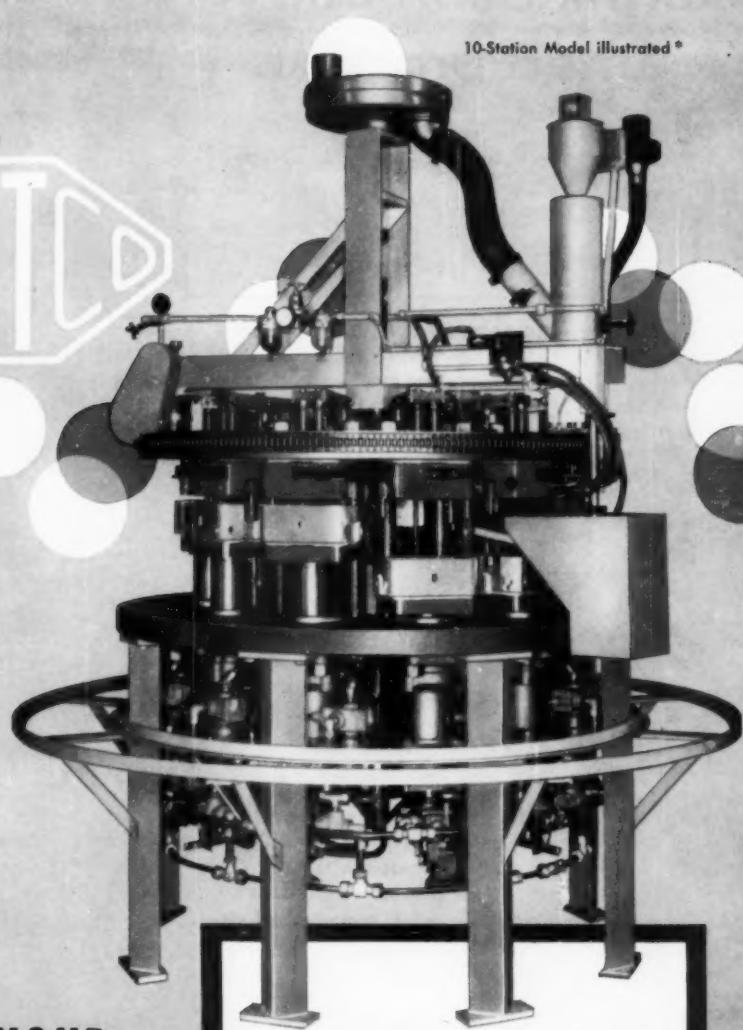
Typical wear parts

Many wear parts have been made from GS-nylon, including such applications as gears, bearings, wear pads, thrust washers, cams, door slides, switch components, bearing liners, etc.

Each use of the new product has solved special problems that were encountered with conventional nylon or other materials. Typically, it is used for any wear part that must wear longer and exhibit greater dimensional stability than is possible with the use of ordinary nylon.—End

NEBUTT^{CO}

10-Station Model illustrated*



**AUTOMATE YOUR
PLASTIC MOLDING
OPERATIONS
WITH NEBUTT^{CO}
ROTARY PRESSES**

BIG-PROFIT FEATURES:

- Inexpensive molds, for thermosetting compounds
- Can use up to 20^o different molds, one press
- Molds can be changed while press is operating
- Simple ejection of parts
- Hopper-fed — rotating supply
- Adjustable production cycle
- Adjustable temperature in mold holders
- Low cost molding of large or small quantities
- Presses can be furnished for many applications
- For descriptive bulletin or demonstration of machines in operation, contact

NEW ENGLAND BUTT CO.

Division of Wanskuck Co.
304 Pearl Street • Providence 7, R. I.

Press is also made in 30-station model.

Determination of average cell volume in foamed products

By R. H. Harding*

A method is presented for the measurement of the open cell content and average cell volume of a foamed product. The technique is simple, adaptable to routine operation, and suitable for either quality control or research work. The required apparatus is already available in the laboratories of most of the suppliers. Experience indicates that use of the new approach may well facilitate an improved understanding of foam technology. Factors which have previously been recognized qualitatively may now be studied quantitatively with relative ease.

Rigid and flexible cellular materials are achieving growing importance for application as structural, insulating, cushioning, and buoyant products. In many cases, the suitability of foamed materials for specific uses is a function of the manufacturer's ability to produce an appropriate cell structure. Rigid foams useful as thermal insulators must contain the highest possible percentage of closed cells; these should be small and uniform in size.

In general, the practice in the cellular plastics industry has been to estimate cell sizes either by microscope counting or by direct visual comparison. The former technique has the disadvantage of being too time-consuming for routine application; in addition, only a very small specimen is observed. The latter approach is a qualitative estimate at best: local experience indicates that the observer's opinion is influenced largely by the coarsest structures present. As a result of these drawbacks, the relationships between structure and properties are poorly understood.

Neither of the above methods gives information about the open cell content of a foam. An apparatus that provides such data was recommended by Remington and Pariser in 1957 and is now a

widely used tool in the evaluation of cellular plastics¹. Their method requires only a few minutes to make a measurement; it functions by measuring the volume of air displaced by a foam specimen in a closed chamber. The required equipment is simple, and the only major problem noted is the sensitivity of results to specimen dimensions.

It is generally conceded that ad-

¹W. J. Remington and R. Pariser, "A new apparatus for determining the cell structure of cellular materials," Contribution 119 of E. I. du Pont de Nemours & Co. Inc., Elastomer Chemicals Dept., presented before the Division of Rubber Chemistry, American Chemical Society, New York, Sept. 12, 1957.

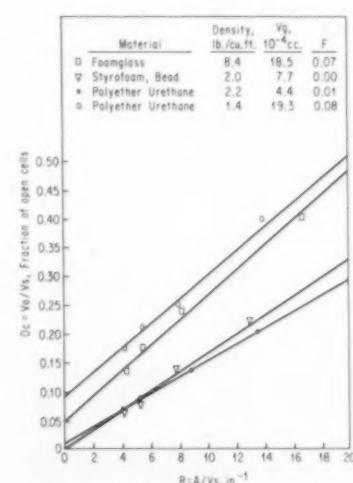


FIG. 1: Actual Oc-R plots obtained for several foamed, rigid materials.

*Research Dept., Union Carbide Chemicals Co.

ditional reliable information concerning the structure of foamed products would prove useful for the progress of modern foam technology. For example, cell size data could be related to manufacturing conditions and to foam properties if they could be made available on a routine basis.

The method described in this paper provides a means for determining the volume fraction of open cells and the average cell volume in a foam. The test is based on the Remington and Pariser (R & P) apparatus, and may require as little as twice the laboratory time of a standard R & P open cell determination. The sensitivity of an R & P result to specimen dimensions is eliminated, and a reliable measure of cell size is, therefore, obtained without recourse to the necessity of microscopic counting.

Derivation of relationship

The observation that the apparent percentage of open cells in a foam is influenced by specimen dimensions provides the basis for the new method. An analysis of the internal geometry of a cellular product leads simultaneously to the explanation for this phenomenon and to the derivation of the quantitative cell volume relationship. The nomenclature and symbols used in the following discussion are presented in the box on p. 160.

Consider first a unit volume of foam. By definition this sample contains N average cells, each of volume V . It is possible that some fraction F of these cells will interconnect in a continuous matrix because of imperfections in the cell walls. In this case only $N(1-F)$ average cells would retain their individual identities.

Let the unit volume of foam be intersected by a plane of unit

Naugatuck KRALASTIC

THE ORIGINAL ABS RESIN



KRALASTIC parts molded for The Lindsay Co., by Contour Plastic Molding Co., St. Paul, Minn., and Royette, Inc., St. Paul, Minn.

Your move to KRALASTIC

KRALASTIC is the original ABS rubber-resin plastic. It is rust-proof, immune to corrosion.

Shown above are several of the new KRALASTIC® parts used in the Lindsay water softener. Lindsay uses KRALASTIC in these moldings because KRALASTIC has high chemical resistance, great dimensional stability, easy injection molding and easy solvent welding characteristics. The new KRALASTIC

retains its modulus better than any other impact plastic.

KRALASTIC is also used in pipes and fittings, conduits, for intricate housings, machine parts, tool handles, wheels ... any place where strength, light weight, dimensional stability and freedom from corrosion are assets. For more information, write us today at the nearest district office indicated or the address below.



United States Rubber

Naugatuck Chemical Division

615K ELM STREET
NAUGATUCK, CONNECTICUT

KRALASTIC RUBBER-RESINS • MARVINOL VINYL • VIBRIN POLYESTERS

Akron • Boston • Chicago • Gastonia • Los Angeles • Memphis • New York • Phila. • CANADA: Naugatuck Chemicals • Elmira, Ont. • Cable: Rubexport, N.Y.

area. The number of individual average cells through which this plane passes must be $N^{2/3}$ $(1-F)^{2/3}$. At the same time, since the plane passes through the interconnected maze of open cell units $(NF)^{2/3}$ times, it becomes evident that a perfectly continuous open matrix is not a practical requirement of the method. All of the open cells will be revealed to the hypothetical plane if only a single member of each of the interconnected series of cells is intersected.

The significance of these observations becomes evident when an actual sample of a cellular material is considered immersed in a fluid. The volume of this sample may be V_s units by direct external measurements, but the volume of fluid displaced will be less than V_s in proportion to its penetration into the specimen. A fluid such as air will be able to fill both the cut cells at the specimen surface and the communicating open cells of its interior.

For simplicity, let the foam sample be a rectangular block H units high, T thick, and W wide. Its geometric volume is, of course, $V_s = HWT$ and its nominal surface area is

$$A = 2WT + 2WH + 2HT \quad \text{Eq. 1}$$

The total volume of an average cell is the sum of its associated solid and gas volumes:

$$V = V_p + V_g \quad \text{Eq. 2}$$

The volume exposed to the immersing fluid when a cell is opened is only the V_g component.

The foam specimen contains a total of NV_s average cells. The interior volume of the specimen that connects directly to the surface is $NFV_g V_s$. When all specimen faces are free of continuous skins, the number $AN^{2/3}$ $(1-$

Table I: Comparison of cell volume averages by gas displacement (V_g) with microscopic estimates

Foam sample	Average cell volume, 10^{-4} cc.		
	Microscope*	Displacement	Deviation
1	15.9	23.7	-7.8
2	7.7	4.6	+3.1
3	9.0	8.4	+0.6
4	12.3	11.4	+0.9
5	13.8	10.1	+3.7
		Average = +0.1	

* Each microscopic value was calculated from averaged measurements of the apparent height and width of about 50 individual cells.

$F)^{2/3}$ of originally-closed cells within the specimen surface will have been cut open by sample preparation operations. On the average, one half of each cut cell must be retained by the sample; the gas volume exposed by cutting operations is, therefore, $AN^{2/3} (1-F)^{2/3} V_g/2$.

The volume of gas displaced by a foam specimen is the geometric volume, less the volume of the specimen's surface-connected open cells, less the volume of cells in the specimen's cut surface; mathematically, it is

$$V_d = V_s - NFV_g V_s - AN^{2/3} (1-F)^{2/3} V_g/2 \quad \text{Eq. 3}$$

The apparent open cell volume indicated by gas displacement is

$$V_o = V_s - V_d = NFV_g V_s + AN^{2/3} (1-F)^{2/3} V_g/2 \quad \text{Eq. 4}$$

The indicated volume fraction of open cells is

$$O_c = V_o/V_s = NFV_g + AN^{2/3} (1-F)^{2/3} V_g/2 V_s \quad \text{Eq. 5a}$$

Defining R as the geometric surface area-to-volume ratio, A/V_s ,

$$O_c = NFV_g + N^{2/3} (1-F)^{2/3} RV_g/2 \quad \text{Eq. 5b}$$

Equation 5 represents a straight line function of O_c in terms of R , and may be solved for the V_g and F of any foamed product containing an appreciable percentage of closed cells. The only experimental requirement is that the

only cell content of a sample be determined at a minimum of two known R levels.

A more convenient form of Eq. 5 may be derived for actual usage. It provides an advantage by revealing the influence of foam density on the apparent O_c of a sample at any R .

The density, D_f , of any foam sample must equal that of an average cell. From a material balance based on Eq. 2, it is evident that

$$(D_f) V = D_p V_p + D_g V_g \quad \text{Eq. 6a}$$

If it can be assumed that the density of the gas contained within the closed foam cells is nearly equal to that of the surrounding air, then its effective density, D_g , is zero. Eqs. 6a and 2 rearrange to

$$V_g = V \left(1 - \frac{D_f}{D_p} \right) \quad \text{Eq. 6b}$$

By substitution of Eq. 6b in 5b, and upon recognition of the fact that N must equal $1/V$, the preferred solution is found to be

$$O_c = F \left(1 - \frac{D_f}{D_p} \right) \quad \text{Eq. 7}$$

$$+ \frac{R V_g^{1/3}}{2} (1-F)^{2/3} \left(1 - \frac{D_f}{D_p} \right)^{2/3}$$

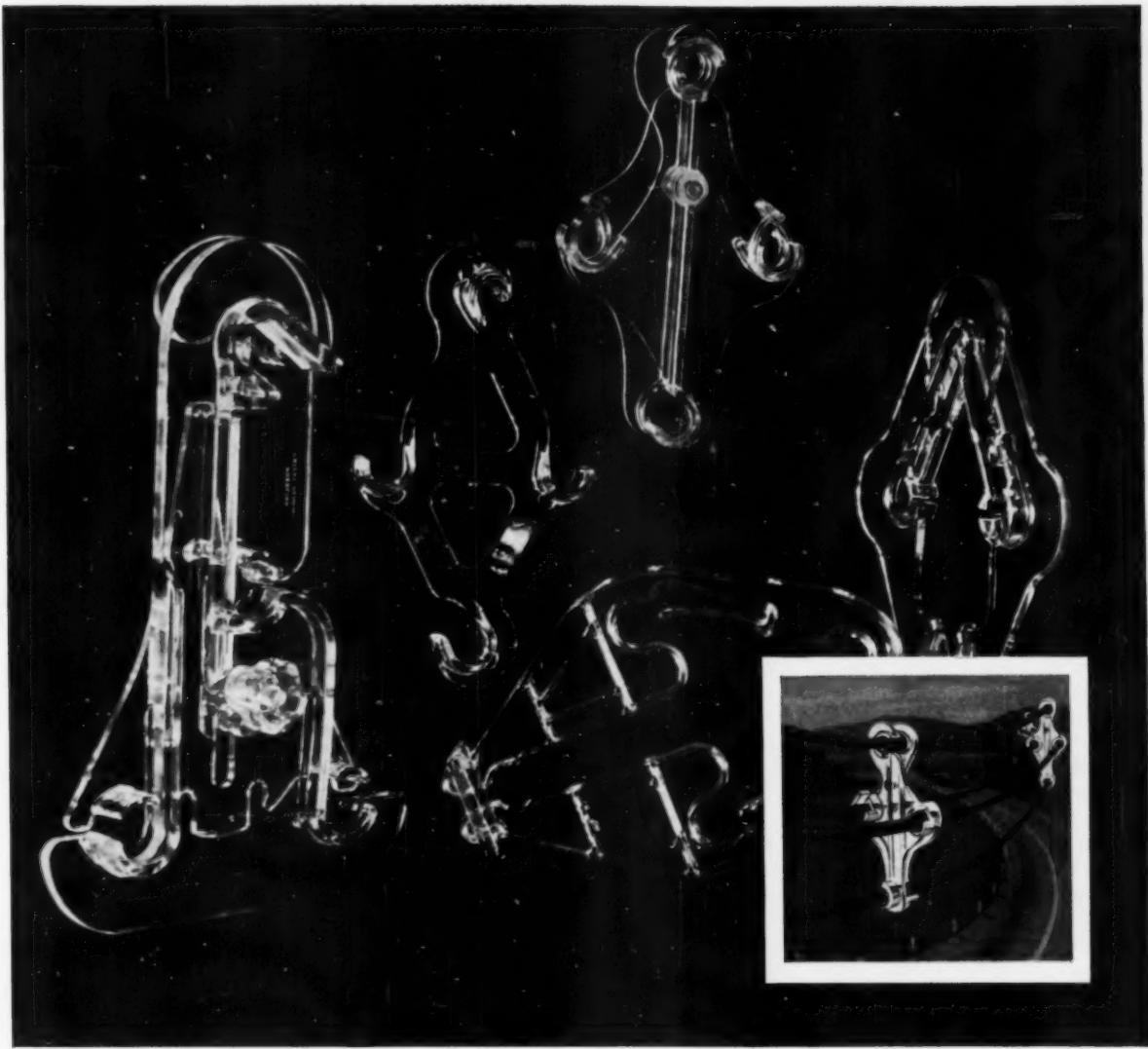
Naturally, the dimensional units employed must be consistent. In local work the experimental data are obtained in the English system, but are converted to the metric system for convenience in reporting V_g .

Experimental procedure

The apparatus, technique, and preliminary calculations required for the cell volume determination are those described by Remington and Pariser.¹ They are reviewed briefly in the following two paragraphs. It is suggested that the

Table II: Effect of specimen dimensions on apparent open cell content

Foam sample	Experimental O_c at the indicated R level		
	$R = 0$	$R = 4 \text{ in.}^{-1}$	$R = 8 \text{ in.}^{-1}$
1	0.042	0.146	0.250
2	0.100	0.153	0.206
3	0.022	0.098	0.175
4	0.010	0.081	0.152
5	0.022	0.084	0.146



Cable spacers demonstrate strength and durability of

PLEXIGLAS

Shown above are some of the many types of aerial spacers—used to support and separate electric power lines—that are being molded of PLEXIGLAS® acrylic plastic. Why? Because PLEXIGLAS provides the strength, weather resistance and electrical properties needed to meet the rugged service requirements involved in this application. In addition, PLEXIGLAS can be molded accurately to the intricate clamp designs and contributes the light weight that is so important in these massive moldings.

Does this dramatic example of the advantages of PLEXIGLAS give *you* an idea for its use? We will be glad to send you full details about this quality molding material, and to provide design assistance on specific projects.



Chemicals for Industry

**ROHM & HAAS
COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

In Canada: Rohm & Haas Company of Canada, Ltd.,
West Hill, Ontario

reader consult the original paper for full details.

Essentially the R & P method measured V_d , the volume of air displaced by a foam specimen in a closed chamber. This volume represents the space occupied by the closed cells plus the cell walls in the specimen. Subtracting V_d from the geometric specimen volume, V_s , gives the volume of open cells in the specimen, V_o . The foam weight, divided by the specific gravity of the solid of which it is composed, provides the volume of cell walls. The volume percentages of open and closed cells, and of foam solids, are now calculated for the specimen.

Volumes are measured in an apparatus containing two calibrated, sealed chambers separated by a manometer. One of these encloses the specimen with some residual volume of air. The reference chamber contains a known volume of air, adjustable with a mercury-filled burette, at the same temperature and pressure. A slight vacuum is imposed on both systems when the volume of each is increased by equal increments. The actual volume of air displaced by the specimen is shown by R & P to be available when this operation produces no pressure differential between the chambers. A few trials normally suffice to leave the manometer balanced both before and after the vacuum is drawn.

Specimens: In the new cell volume method, at least two such R & P readings of V_d are required for each determination. Local experience indicates that four readings per specimen, each at a different geometric surface-

to-volume ratio (R), provide more satisfactory results.

To obtain representative sampling a reasonably large, skin-free foam specimen is preferred. For simplest preparation, a rectangular specimen is indicated. The local specimen has an original volume of about 3 cubic inches. It is a rectangular block 1.8 in. long (H) and 1.3 in. in width (W) and thickness (T), cut from the foam on a band saw and blown free of dust. An analytical balance is used for weighing specimens to the closest milligram; a dial indicator provides dimensions to closest 0.001 inch.

Throughout the physical operations, care is taken to avoid rupturing cell walls. Rough handling would be especially probable on the saw or when removing specimens from the R & P apparatus.

When the specimen's original V_d is determined in the displacement apparatus to the closest estimated 0.01 cc., it is returned to the saw. A single cut perpendicular to the long axis of the preferred specimen increases R from about 4 to about 5 reciprocal inches. This cut is normally made at the center of the specimen. Note that Eq. 7 is not affected by removal of the incremental volume of foam destroyed by the saw.

The new height and weight of the two specimen fragments are determined and a new measurement of V_d is obtained. In practice, the specimen is now returned to the saw where each piece is again bisected in a plane perpendicular to the original long axis. The resulting four pieces, with their overall R of about 8, are returned to the balance, the

dial indicator, and the R & P apparatus. To obtain a fourth point at an R of about 14, the pieces of the original specimen are again bisected on the saw and reprocessed as a single specimen.

It is not presumed that the precision with which it is recommended that measurements be recorded is justified by the apparatus or technique employed. The approach has the double advantage of minimizing numerical rounding errors and encouraging careful laboratory operation.

Calculations: The experimental O_c at any R is simply the appropriate $V_o/V_s(n)$ ratio. $V_s(n)$ is the overall dial-indicator-measured specimen volume after n auxiliary saw cuts. For the recommended specimen treatment, the empirical R may be calculated most conveniently by means of the equation

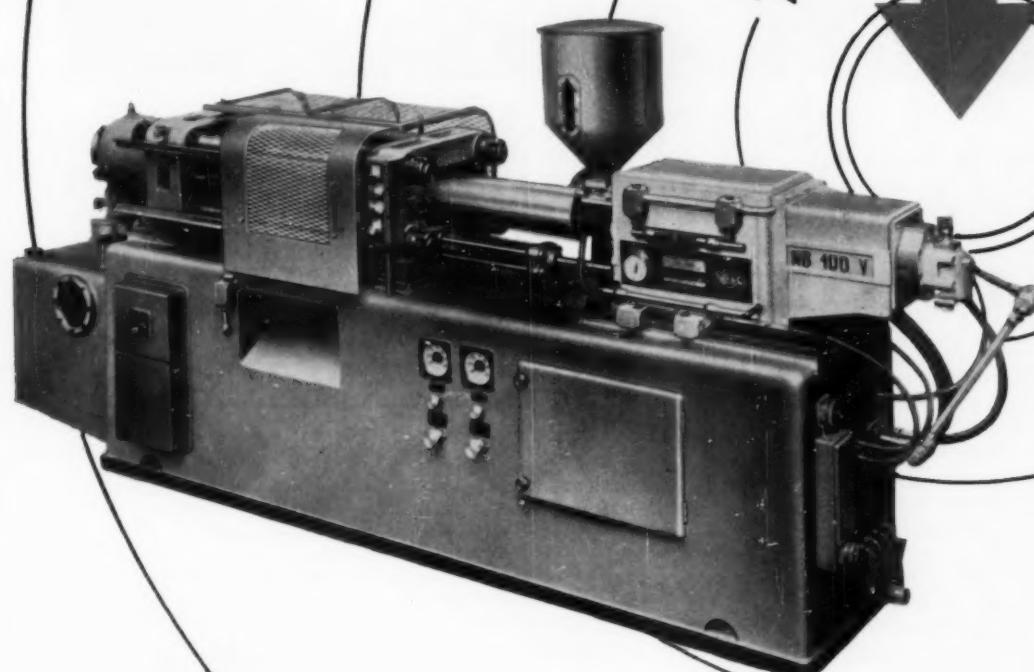
$$R(n) = \frac{2(n+1)}{H - n\Delta H} + \frac{2}{T} + \frac{2}{W} \quad \text{Eq. 8}$$

This relationship is obtained directly from a knowledge of overall specimen geometry during the suggested operations. The only new variable is ΔH , the reduction in height of the stacked wafers of the original specimen due to material losses during a single auxiliary cut.

It is now possible to plot $O_c(n)$ on the ordinate against $R(n)$ on the abscissa of a graph. A straight line may be passed through the experimental points. The intercept on the ordinate at $R = 0$ provides a measure of F at the calculated specimen density; the slope of the line is the function of V_g indicated by (To page 212)

Definitions of alphabetical terms

A —Geometric or nominal surface area of a foam specimen determined by external measurement (sq. in.).	n —Number of auxiliary cuts made in a specimen.
Df —Density of a foam specimen (lb./cu. ft.).	Oc —Apparent volume fraction of open cells in a foam specimen of fixed dimensions.
Dg —Effective density of the gas within a foam specimen.	R —Geometric surface-to-volume ratio of foam specimen (in. ⁻²).
Dp —Density of the polymer constituting the foam.	T —Thickness of a foam specimen (in.).
F —Fraction of completely interconnected (open) cells in the interior of a foamed product.	V —Overall volume associated with an average cell.
H —Height of a foam specimen (in.).	Vd —Total volume of air displaced by a foam specimen of fixed dimensions.
	Vg —Gas volume associated with an average foam cell (cc.).
	Vo —Apparent total volume of open cells in a foam specimen of fixed dimensions.
	Vp —Volume of polymer solids associated with an average foam cell.
	Vs —Geometric or nominal volume of a foam specimen, determined by external measurement (cu. in.).
	W —Width of a foam specimen (in.).



N.B. 100 V - SCREW - PREPLASTICIZING
INJECTION MOULDING MACHINE - Patent
BASF -

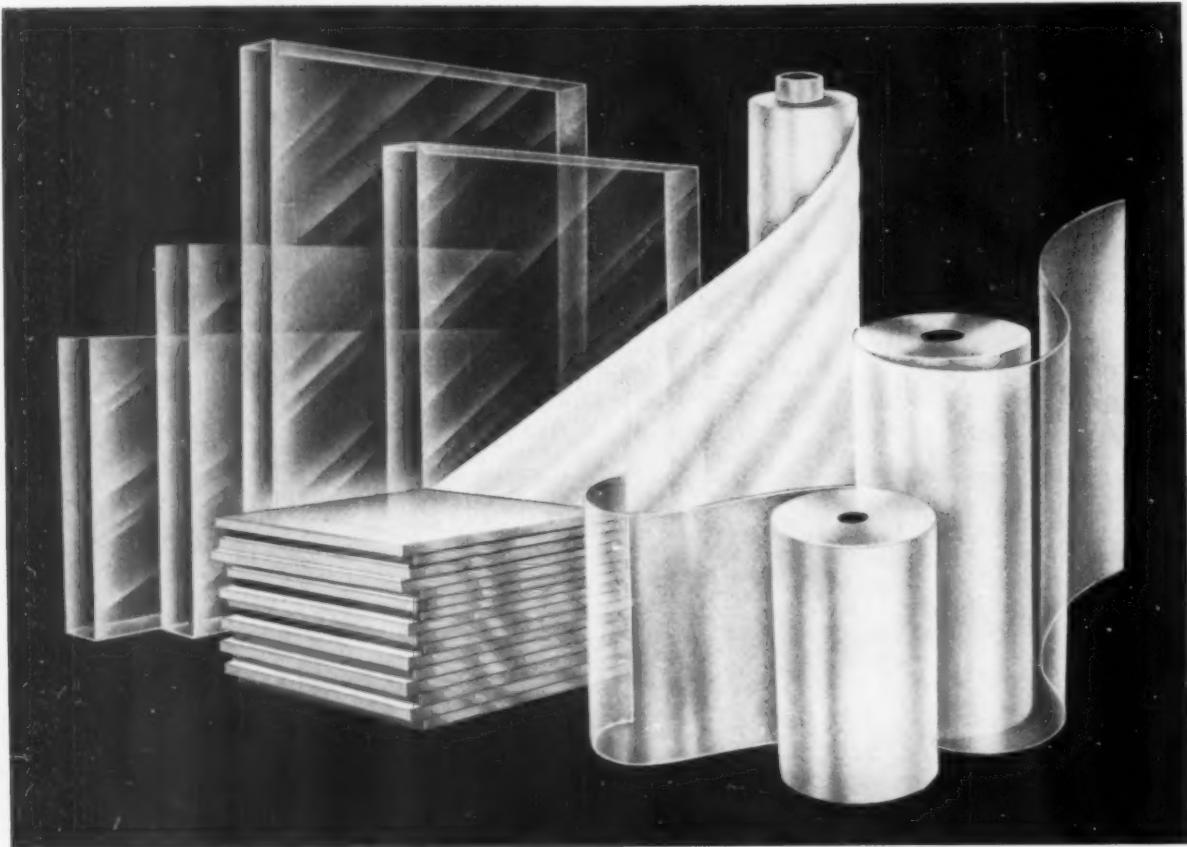


NEGRI BOSSI & C.
PLASTIC MACHINERY

MILANO - Via Bazzini, 24 (Italy)

Telef.: 235.555 - 235.884 - 230.512 - 292.897

Teleg.: NEGRIPOS - MILANO



NOW **FILM** as well as SHEET, ROLL & SLAB STOCK

SCRANTON PLASTIC now offers you a variety of plastics in film, sheet, roll and slab stock for a wide range of industrial applications. Let Scranton become your complete source of supply.

Available in transparent, translucent, or opaque—in wide ranges of colors—all thickness: .003" to 2"; sheet sizes 18" x 24"; 21" x 51"; 33" x 46"; 36" x 48"; 36" x 60"; 48" x 72"; 50" x 72" and 50" x 108".

We also have a special line of vinyl sheeting made expressly for electrotype molds.

Prices are determined by quantity, thickness and sizes. Let us give you quotations on your requirements. Samples supplied on request.

Scranton Plastic Laminating Corp.

3216-18 Pittston Avenue, Scranton 5, Pa.
Telephone Diamond 2-0407

	Film	Sheet	Slab	Rolls	Laminates
Vinylite (Rigid and Flexible)	X	X	X	X	X
Cellulose Acetate	X	X	X	X	X
Acetate Butyrate	X	X	X	X	X
Polystyrene	X	X	X	X	X
Plexiglas & Acetate with Embedments		X	X		
PVC		X	X	X	X
Polypropylene		X	X		
Polyethylene—Regular	X	X	X	X	X
Polyethylene—High Density		X	X		
Propionate		X	X		
Nylon		X	X		
Delrin		X	X		



A new certified catalyst for flexible urethane foams

combines
exceptional stability
with
predictable reproducibility
to control
uniformity in foaming

Nuodex Nuocure 28 is a new stannous catalyst designed specifically to improve the characteristics of one-shot urethane foams. A clear liquid, Nuocure 28 has proved a demonstrable ability to produce improved uniformity in foams which, in turn, results in superior resistance to heat and oxidation. It is exceptionally stable and has extended effectiveness in use.

As all other Nuodex chemicals for the plastic industry, the *stannous content* of Nuocure 28 is certified to assure you of consistent, reproducible results time after time.

Let Nuocure 28 prove its superior catalytic action in your foams. Send for a sample and application data, then compare the results.

NUODEX

special purpose chemicals for industry

NUODEX PRODUCTS COMPANY • ELIZABETH, NEW JERSEY

A Division of Heyden Newport Chemical Corporation

Fungicides • Nickel Salts • Organic Peroxides • Paint Additives • Stearates • Vinyl Additives

NEW DEVELOPMENTS

Many minds at work on new ways to use plastics, new designs, and new product concepts offer ideas you can use.

Fadeproof "drapes"

How to cover a window?

That age-old question has received a brand-new answer with the introduction of injection molded polystyrene "drapes." Based on a 3-in.-sq. module of light-stabilized material, the new covering combines the functions of blinds, draperies, shades, and curtains. In addition, it offers infinite decorating possibilities in the area of room dividers and folding doors.

Manufactured by Jaylis Industries Inc., Los Angeles, Calif., and known as Jaylis traversing draperies, the new decorative medium is produced in any required size by assembling the interlocking square modules on vertical spring steel rods. Widths and lengths are virtually unlimited, governed only by the number of molded polystyrene squares used horizontally and vertically. The entire assembly is suspended on nylon

rollers from standard heavy-duty drapery tracks.

The squares are molded of Dow's Styron 671 Verelite, a light-stabilized material which, incorporating inorganic color pigments, is reported to have a fade resistance many times greater than that of dyes used in fabrics. Thus it is claimed that the draperies will outlast any other window covering on the market, giving many years of trouble-free service while maintaining initial freshness and beauty. It is further stated that the low ultra-violet and infra-red transmission properties of the material block out 99% of the rays of the sun that fade furnishings and 86% of the heat; since heat is controlled at the point of entry or exit, air conditioning and heating requirements are reduced substantially. Also, when Jaylis draperies are used at windows, outdoor awnings and other heat and light control elements are unnecessary.

Although the translucent material used filters out harmful sun rays, it permits passage of a soft diffused light. Horizontal molded-in vents, which are an integral part of the pattern, permit ventilation yet are so designed as to afford visual privacy to the user.

The unusual design of the modules is shown in accompanying photographs. Integral cylinders, 1½ in. long, are molded in on two opposite edges to accommodate the

mounting rods. Separately molded cylinders serve as spacers when the squares are assembled.

The modules are produced in a variety of colors and patterns so that the appearance of the final decoration can be as varied as desired. Not only can odd-sized areas be perfectly fitted by using the correct number of squares, but draperies, screens, or room dividers can be economically and easily resized, and it is no longer necessary to abandon them when moving just because they are not the right size for the new home. While the polystyrene material is highly resistant to breakage, modules are easily replaced in case of damage.

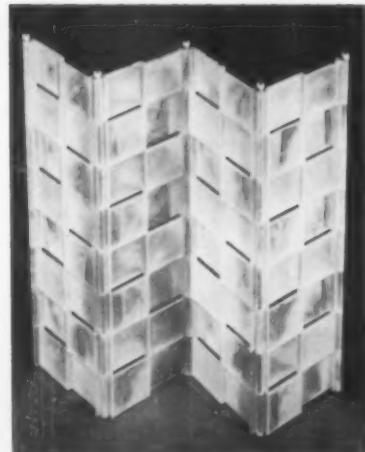
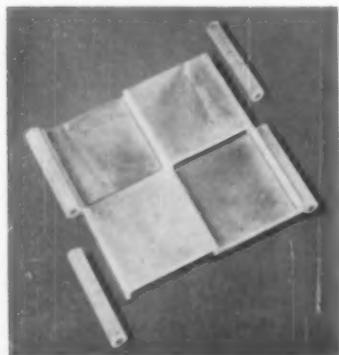
Jaylis draperies are not inexpensive in first cost—a 36- by 84-in. unit is listed by the manufacturer at \$54.81—but it is claimed that the permanence of the material, low cost of maintenance, and savings in air conditioning and heating allows them to compete, in the long run, with the most inexpensive of window coverings available.

Urethane for respirator

Molded polyurethane foam, selected for high-temperature insulating qualities and light weight, houses a new industrial respirator which acts on a heat exchange principle. Use of the respirator permits increased working time in such areas as drying kilns and

(To page 166)

RESTAURANT WINDOW AREA is fully covered with modular styrene drape. A section assembled of 16 modules is shown left below. A single module, with its associated spacers, is at left above.



INTRODUCING THE EGAN AIR COOLED EXTRUDER



Here is the air cooled extruder that offers more effective cooling than any other comparable model on the market today!

Each cylinder zone on the new Egan Air Cooled Extruder is fitted with a high capacity blower. Air from each blower is channeled through the ductwork and a specially designed chamber for a completely dependable, high-velocity flow along the periphery of the zone. You get maximum uniform cooling!

In addition, the Egan Air Cooled Extruder retains all the time tested and proven features found in Egan's other extruder lines—heavy duty thrust bearings, herringbone gear speed reducers, and a host of other operating and maintenance features.

Whatever your requirement in extruders—air cooled, direct electric heat, or "Willert Temperature Control System"—Egan can meet your every need.

Egan Extruders are available in sizes from 2" through 10" with L/D ratios from 20:1 through 32:1.

FREE—Write for your Egan Extrusion Speed Calculator for film, coating and laminating.



FRANK W. EGAN & COMPANY
SOMERVILLE, NEW JERSEY

CABLE ADDRESS: EGANCO—SOMERVILLE (N.J.)

MANUFACTURERS OF PLASTICS EXTRUDERS & ACCESSORIES: PROCESSING MACHINERY FOR PAPER, FILM & FOIL, AIR DRYING SYSTEMS; ROTOGRAVURE PRINTING PRESSES; TEXTILE FINISHING MACHINERY.

REPRESENTATIVES
CHUGAI BOEKI CO., KATO BUILDING, TOKYO, JAPAN
M. H. GOTTFRIED, AVENIDA 16 DE SEPTIEMBRE 10-304, MEXICO, D.F.

LICENSEE
BORE BROS. LTD., WEMBLEY, MIDDLESEX, ENGLAND

NEW DEVELOPMENTS

(From page 164)

lab test rooms, where safe breathing for personnel under high temperature conditions is required.

The complete respirator, made by American Optical Co., Southbridge, Mass., consists of a cylinder-shaped foam shell into which are fitted 65 layers of aluminum screening and a perforated metal outer plate to lock the screens in place. A threaded metal ring, cemented to the top of the foam shell, enables the respirator to be screwed into the clear face piece of an asbestos hood. Price of the respirator is \$7.90.

As the wearer inhales, hot air is drawn through the screen layers, which absorb much of the heat and reduce the temperature of the air reaching the mouth to approximately 100° F. Exhalation pulls heat from the screens and cools the cartridge for the next breathing cycle. In this way, workers can perform necessary tasks in temperatures up to 300° F. for periods up to a half hour. The respirator can be used in low temperature areas; here the heat exchange principle is reversed, and cold air inhaled is made comfortable by the warmer aluminum screens.

The polyurethane foam cylinder is molded at the Putnam, Conn. plant of American Optical, which uses aluminum molds of their own manufacture. The molds are hand-filled with a polyester and catalyst formula, which cures in 30 minutes. This formula is supplied in two-component form by Emerson & Cuming Inc., and is based on diisocyanates produced by National Aniline Div., Allied Chemical Corp.

Thermoformed relief maps

World and United States maps, showing terrain features in three-dimensional relief, are vacuum formed from vinyl sheet by Aero Service Corp., Philadelphia, Pa.

Both maps measure 28 by 18 in., and are said to be the first produced in this size.

The horizontal scales are 962 mi. to the inch for the world map, and 117 mi. to the inch for the U. S. map. Vertical distance scales are exaggerated about 50 times to show terrain in relief up to $\frac{1}{2}$ -in. high.

Each map is lithographed in eight colors, including a mahogany-colored "frame," on 15-mil white vinyl sheet. Vacuum forming is done by Aero using equipment from Autovac Div., National Tool Co., Bridgeport, Conn., and also equipment of their own design and manufacture. This equipment will form vinyl sheet up to 48 by 72 inches.

After the map is formed, it is electronically sealed at the edges to a second 15-mil vinyl sheet, which contains a die-cut slot. A map index, lithographed in black on 10-mil high impact styrene sheet, is inserted through this slot into the space between the two vinyl sheets. The front of the map is then sprayed with a clear acetate lacquer to protect it against dust and dirt.

Price of the maps is \$9.95 each. Vinyl and styrene sheet is supplied by Seiberling Rubber Co., Newcomerstown, Ohio. Sealing equipment is made by Electronics Corp., Brooklyn, N. Y. Lithography is done by Albert J. Becker, Southampton, Pa.

Epoxy-set brushes

A method of setting paint brush bristles with epoxy resin eliminates the oven curing required with rubber-setting methods, and results in a better product for the Brush Div. of the Pittsburgh Plate Glass Co., Baltimore, Md.

The previously-used vulcanization of rubber-setting compounds called for temperatures of 275° F. over a period of 15 to 24 hr., which often



EPOXY RESIN for bristle setting is dispensed by automatic pump into ferrules of paint brush. Compound will cure within a few hours at room temperature.

caused loss of oil in natural bristle brushes and unevenly distributed bristles in synthetic filament brushes. The epoxy resin cures in a few hours at room temperature, and will not shrink in the metal ferrule after cure is finished. Epoxy-set bristles also stand up better than rubber-set bristles in applications involving volatile paint solvents.

Despite the higher cost of epoxy resin, prices of the epoxy-set brushes are said to be competitive with the rubber-set brushes. It is further said that the competitive costs are due to the more efficient production of paint brushes with the epoxy setting method.

The epoxy compound, based on Shell Chemical's Epon resins, is supplied by H. V. Hardman Co., Belleville, N. J. The compound, known as Eposet, costs 79¢/lb. and has a pot life of about 20 minutes. The Hardman firm also supplies curing agent and an automatic pump that mixes, meters, and dispenses the epoxy compound and curing agent in the proper proportion.

PE pipes save 75% labor

It's not necessarily the industrial giant that proves the inherent economics of plastics. Here is the case of a modest-sized water treating service company that went from galvanized metal to medium-density polyethylene for the piping in its ion exchange resin reconditioning plant, and in the process realized significant savings. While the actual installation involved only 400 ft. of pipe, the cash savings came to \$500, which, at more than \$1 per foot, represents worthwhile economies. And the experience (To page 168)



How reinforced plastics molders and high pressure laminators save time, work, material, money with Phenopregs*

1. Phenopreg prepgs simplify molding operations. Only one material—containing both resin and reinforcement—is used. This eliminates the need for weighing, mixing and hand-applying the compounds. Also the need for resin-reinforcement ratio control.

2. Phenopregs reduce hand labor. Elimination of hand dispersion of resin is one means. Use of custom-slit, sheeted and die-cut Phenopregs is another. And, where simple shapes are to be molded, roll material can frequently be fed right into the dies, for still a third saving of labor.

3. Phenopregs make mass production possible. By eliminating the lengthy process of hand impregnation, and, in the case of hand layups, by eliminating slow production cycles due to long periods for curing, Phenopregs speed up output, improve delivery schedules.

4. Phenopregs mean cleaner molding operations. They eliminate the need for cleaning up after wet molding, saving time, labor.

5. Phenopregs reduce waste. This is because there is no spillage and no mold overflow.

6. Phenopregs cut storage and handling costs. Because only one material has to be stored and handled, Phenopregs greatly reduce costs for these items.

7. Phenopregs produce better products. Phenopregs are superior because they enable the molder to (a) keep a uniform resin-reinforcement ratio throughout his laminate; (b) exercise strict control over the resin con-

tent; (c) control the cure because of the even dispersion of curing agents; (d) avoid defect-producing trapped air pockets or tiny air bubbles; and (e) eliminate the harmful effects of moisture . . . since the Phenopregs come predried.

8. Phenopregs build business. Phenopregs open new marketing opportunities by creating improved products—products more desirable because their physical, chemical, mechanical and electrical properties are always consistent.

Fabricon—First in Plastic Impregnating Materials for...

Decorative Laminates Fabricon offers you the broadest line of clear and tinted overlay papers, contemporary and classical patterns, wood grains, solid colors, core stock sheets and balancing papers ever manufactured by any single source.

Impregnated Glass Cloth Applications Fabricon offers you phenolic, epoxy, silicone and polyester impregnated grades suitable not only for present applications, but for great new potential uses.

Electrical and Mechanical Applications. Fabricon offers you a full

line of phenolic impregnated papers that meet or exceed NEMA and Military Specifications.

High and Low Pressure Molding Fabricon offers you a broad choice of phenolic impregnated fabrics, from heavy canvas duck to fine, lightweight cotton sheeting. All materials meet or exceed NEMA and Military Specifications.

New and Specialized Applications Fabricon offers you its combined experience, manpower and research facilities to help develop new materials for your specialized requirements.

For specific details, write, outlining your application

*Registered Fabricon prepreg trademark

FABRICON



FABRICON PRODUCTS

A Division of the EAGLE PICHÉR Company
1721 W. Pleasant Ave. • River Rouge 18, Mich.
6430 E. Slauson Avenue, Los Angeles 22, California

From Slip to Static...

plastic problems are solved
with

EZE ADDITIVES

proven effective for...

Vinyl • Polyethylene • Nylon

On Nylon, Synthetic
and Wool Carpeting...

STAT-EZE

STAT-EZE overcomes the annoyance of static accumulation and resoiling problems. It is easy to apply by spraying, sponging or immersion. It is tenacious and hard to rub off...STAT-EZE reduces the static charge on undergarments, upholstery materials and dresses made from synthetic fibres.

For Polyethylene

extrusions and moldings... wherever quality specifications require precise slip and reduced static charges. An unusual lubricant that improves production speeds...SLIP-EZE gives your product an attractive gloss... without discoloration or a greasy feel. FDA approved.

VYN-EZE

For Vinyl

films and sheeting... to significantly reduce tack and block. You can achieve greater efficiency and speed in the winding, handling and converting of vinyls. VYN-EZE will give you a new standard for improved tack and clarity. FDA approved.

Write for prices, and technical information

FINE ORGANICS, INC.

Lodi, New Jersey

Headquarters for custom synthesis;
bench, pilot, and production scale.



BEFORE AND AFTER. At left is galvanized metal pipe which was originally used in reconditioning system. Severe corrosion made frequent maintenance and replacement necessary. At right is a section of polyethylene pipe. Both are shown after one year's service.

suggests that other users may accomplish corresponding savings in their pipe operations.

In this particular installation, the pipe carries a brine solution under 50 p.s.i. at ambient temperature, as well as water and ion exchange resin. The polyethylene pipe resin is supplied by Union Carbide Plastics Co.; the pipe is extruded by Triangle Conduit & Cable Inc., New Brunswick, N. J.; and it is distributed by Aaron & Co., New Brunswick.

For the user, Consumer Heating and Plumbing Co., Summerville, N. J., the polyethylene pipes solved a serious corrosion problem at a saving in cost. Stainless steel, which also would have solved this problem, would have cost considerably more than the PE installation. Labor was reduced because of the light weight of the pipe one-fifth that of steel); need for fewer joints (because of flexibility); elimination of threads (pipe is joined by expandable metal clamp), as well as several ease-of-handling features.

... And in brief

- Series of fuseholders, blown fuse indicating, and non-indicating, are molded by Engineered Plastics Inc., Watertown, Conn., of Plaskon alkyd molding compound for Fuse Indicator Corp., Boston, Mass. The Blow-Glow fuseholders are said to have the high arc and insulation resistance and dielectric values sought by the military services for high altitude missile as well as rocket applications.

- Toy baby bath set, molded of polyethylene, is scaled to the needs of the 8-in. doll which comes along with the bath, bassinet, and covered diaper pail. Manufactured by Kiddie Brush & Toy Co. Inc., Jonesville,

Mich., from material supplied by Eastman. It retails at \$1.98.

- Swept-back-style series of marine windshields for run-a-bout boats is now thermoformed of Plexiglas methacrylate sheet by Premier Plastics Mfg. Co. Inc., Minneapolis, Minn. Available in heights from 12 in. to 22 in., the stock shields fit boats with deck widths from 46 in. to 78 inches. Custom made units are available for others.

- Called the Dy-O-Rama, a 46- by 48-in. landscaped HO model railroad layout is now being molded from Koppers Dylite expandable polystyrene by Life-Like Products Inc., Baltimore, Md., at \$24.95, complete with track. It can easily be carved to modify the original scene.

- Large-scale models for the display industry (6-ft. bowling pins, 7-ft. hot dogs, etc.) are now molded in reinforced plastics by TobinCraft, Cleveland, Ohio, using Vibrin polyester resin made by the Naugatuck Chemical division, United States Rubber Co.

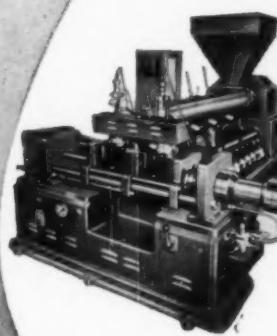
- Resin-bonded fibrous glass in a continuous rotary dryer has eliminated corrosion from hydrochloric acid and water vapors. Fabricated by du Verre Inc., Arcade, N. Y.

- Flexible vinyl jar opener from W. L. Gill Co., Redlands, Calif., is a 2-in.-deep cone with five interior gripping ledges from 1½ to 3½ in. I. D. The 2-oz. opener lists for 49¢, comes in red, yellow, blue, and green. Item is injection molded of Goodrich Geon vinyl by Molded Products Div., Stauffer Chemical Co., Los Angeles, Calif.—End

The key to your plant needs!

KTS

Blow Molder!
Injection Molder!
Extruder!



**Semi Automatic
Blow Molder**

2-mold model
3-8 pcs/min (cycles)
5"/dia x 11"/hgt
(Size limitation of bottles)

Main Products

- Semi Automatic Blow Molder
- Injection Molder
- Upward Inflation Tubular Film Making Unit
- Extruders - 42, 50 & 75mm
- Extrusion Dies
- Plastic Granulators
- Belt & Tube Take-up Attachments
- Electric Wire Coating Attachments

KATO SEISAKUSHO CO., LTD.

70, 4-chome, Higashi Magome-machi, Ohta-ku,
Tokyo, Japan

RONA™

SYNTHETIC

PEARL PIGMENTS

FOR COMPOUNDING INTO

- POLYETHYLENE
- POLYSTYRENE
- VINYL
- ACETATE
- NITRATE
- ACRYLICS
- CASEIN
- POLYESTERS
- PHENOLICS (CAST)
- ACRYLICS (CAST)
- POLYPROPYLENE
- and other resins

COATING ALL SURFACES

Rona Pearl Pigments are heat and light stable, non-reactive, non-corrosive, and impart high pearly luster, exceptional depth and brilliance at very low cost.



RONA PEARL CORPORATION

A Division of Rona Laboratories, Inc.
East 21st and East 22nd Sts., Bayonne 5, N. J.
Manufacturers of Pearl Essence exclusively
Plants: Maine • New Jersey • Canada



**Do you
have
a sawing problem?**

**Cutting Tool
Manufacturing Division**

1250 East 222nd Street
Cleveland 17, Ohio

**MOTCH AND
MERRYWEATHER**

LITERATURE

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Polyester Resins" by J. R. Lawrence.

Published in 1960 by the Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 251 pages. Price: \$5.75.

Another book in the Reinhold Plastics Applications series, this work on polyesters serves the useful purpose of putting a great deal of information in one place. Requiring only a basic knowledge of chemistry, the book is very readable and covers all the important subjects adequately. Included are chapters on the chemistry, properties, resin manufacture, formulation and compounding, and fabricating processes pertinent to the technology of polyester resins. Three appendixes and additional tables of data throughout the book provide the reader with much useful information. This publication is worth having if you're in the polyester business or want a good primer on the subject.—G.R.S.

"Thermoplastics" by Heinz Mandler.

Published in 1959 by VEB Carl Marhold Verlag, Halle (Saale), East Germany, in German under the title "Duroplaste." 174 pages. Price: DM 13.55 (\$3.50).

Written as a guide to engineers and designers responsible for saving material costs to fulfill the Five-year Plan of the Russian Zone of Germany, this volume is a concise presentation of the properties, processing techniques and test methods for thermoplastic materials. Mechanical and physical properties are presented graphically and in table form. The book contains approximately 116 diagrams and illustrations.

"The Plastics Industry of Switzerland" Volume II.

Published in 1960 by Verlag fuer Wirtschaftsliteratur G.m.b.H., Zurich, Switzerland, in German, as "Die Kunststoff-Industrie der Schweiz." 200 pages. Price: \$5.50.

The main section of this volume is an alphabetical listing in German of Swiss suppliers and manufacturers of plastics products and machinery; translations appear under the German headings. A listing of importers and distributors, showing products handled by them, and the companies they represent; a brief outline of plastics raw materials produced in Switzerland; and an alphabetical listing of tradenames;

are also provided. Volume I, which appeared earlier, is a listing of Swiss plastics manufacturers.

"Plastics in Austria."

Published in 1959 by Julius Dressler, Vienna, Austria, in German as "Kunststoffe in Oesterreich." 225 pages. Price: about \$8.00.

This small volume is a reference book combined with a directory of Austrian manufacturers of plastics materials and machinery. Property charts, specifications, and informative articles about major applications for plastics materials are included. All listings are in German and no English vocabulary or index are provided.

Diallyl phthalate. Colors and forms available, molding data, molding and electrical properties; uses, etc., for a line of Diall diallyl phthalate molding materials: Diall 50-01 (Orlon filled); Diall 50-51 (Dacron filled); Diall 51-01 (asbestos filled); Diall 52-01 (glass filled, short fiber); Diall 52-20-30 (glass filled, long fiber); and others. 12 pages. Mesa Plastics Co., 11751 Mississippi Ave., Los Angeles 25, Calif.

Industrial plastics. Properties and application data for the complete warehouse availabilities of Polycenco industrial plastics—nylons, TFE fluorocarbons, polycarbonates, chlorinated polyethers, and cross-linked polystyrene. Includes data on Fluorosint, a TFE-based resin. 12 pages. The Polymer Corp. of Pa., Reading, Pa.

Production facilities. "Engineered Reinforced Plastics Structures and Components" describes the production facilities and services available—plastics engineering, manufacturing facilities, structural, tool making, precision forming and molding, and metal bonding. 16 pages. Fairchild Plastics Branch, 1275 Marconi Blvd., Copiague, N. Y.

Phenolic laminate. Grade selection table; application, physical, and electrical properties; tolerances of molded and sanded plate; standard plate size, decimal equivalents; and other technical data for Micarta paper and fabric grades of sheets, angles, channels, zees, and rods. Bulletin 63-060. 4 pages. Similar

data for asbestos and glass grades (Bulletin 63-061, 4 pages); and molded rod (Bulletin 63-360, 2 pages). Westinghouse Electric Corp., Micarta Div., Hampton, S. C.

Epoxy compounding. "The Techniques of Using Epoxy Plastic Tooling Materials" is a manual showing how a line of epoxy materials can be used to produce master Keller models, master duplications, prototypes, and other tooling units. Approximately 50 illustrations. Ren Plastics Inc., 5422 S. Cedar St., Lansing 9, Mich.

Roll leaf stamping. Booklet contains two technical papers—"Hot Leaf Stamping" and "Developments in Finishing Molded Plastics by the Roll Leaf Stamping Method"—relating to the process of finishing, decorating, etc., molded plastics. 12 pages. OlsenMark Corp., 124-132 White St., New York 13, N. Y.

Vinyl panels. Sizes and thicknesses available, patterns, uses, and a sample swatch for Panlam translucent vinyl decorative materials made by Polyplastex. Uses include partitions, illuminated ceilings, space dividers, folding screens, displays, window treatments, etc. 4 pages. Kerber Enterprises Co. Inc., 132 Spring St., New York 12, N. Y.

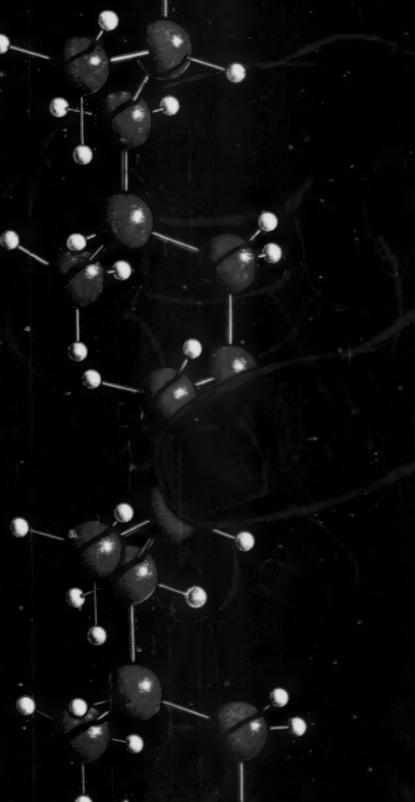
Laminated plastics. Brochure discusses numerous uses for fabricated parts that can be punched, machined, ground, drilled or turned from Insurok sheet, tubes, and rods; outlines the company's fabrication service and compression molding facilities. Catalog 20.000.13. 8 pages. The Richardson Co., 2731 Lake St., Melrose Park, Ill.

Molding facilities. Outlines the company's molded products service, which includes design of the part, design and fabrication of the mold, and molding of the part. 8 pages. Formica Corp., 4614 Spring Grove Ave., Cincinnati 32, Ohio.

Vinyl stabilizers. Bulletin is designed to help plastics engineers and formulators to select vinyl stabilizers for various applications. Includes technical data on the use of these stabilizers in calendering, extruding, and injection molding (To page 172)

Moplen*

POLYPROPYLENE



from

MONTECATINI

*milestone in the conquest
of inner space*

Everywhere chemists are exploring the way molecules are put together... putting atoms together in exact, predetermined relationships with each other... producing spatially-ordered molecules... making useful products from these polymeric materials with designed-in properties for specific applications.

Leader in this conquest of inner space is Montecatini, who developed the first stereospecific polymer, MOPLEN® polypropylene. The forerunner of a revolutionary class of plastic materials discovered by Giulio Natta of the

Polytechnic Institute of Milan, MOPLEN® is being widely used in Europe and in the United States.

Montecatini continues to explore this new world of structural chemistry... is developing new polymerization catalysts and producing new

polymers with exciting potential as plastics, textile fibers and elastomers in the products of tomorrow.

Wherever you are in the world, you can put these discoveries to work for you. Look to Montecatini for MOPLEN®... and for new advances in the conquest of inner space.

Montecatini Trademark



MONTECATINI

SOC. GEN., MILANO, ITALY

U. S. and Canada Representative: CHEMORE CORPORATION • Two Broadway, New York 4, N.Y. • BO 9-5080

LITERATURE

(From page 170)

applications, as well as in plastisols and modified plastisols. 18 pages. *The Harshaw Chemical Co.*, 1945 E. 97th St., Cleveland 6, Ohio.

Polyester-epoxy rods, tubes, and shapes. Features, uses, sizes, etc., for a line of Polygon Glasdramatic RP rods, polyester and epoxy shapes, etc. 4 pages. *Polygon Plastic Co.*, Walkerton, Ind.

Vacuum gages. Principles of operation, advantages, pressure ranges, etc., for a line of vacuum gages, which are used in vacuum metallizing and other processes. Catalog 175. 6 pages. *Hastings-Raydist Inc.*, Hampton, Va.

Plastics in Refrigeration. Bulletin contains two papers delivered at Domestic Refrigerator Engineering Symposium of ASHRAE, Feb. 1, 1960, in Dallas, Texas. "Realistic Properties of Plastics Materials Applied to the Requirements of the Refrigeration Industry" and "The Assurance of Satisfactory Performance of Plastics Parts in Refrigeration." 50 pages. Price: 1-10 copies, \$1.00 each; 10-25, 75¢ each; 25-100, 60¢ each; 100 or over, 50¢ each. *The Society of the Plastics Industry Inc.*, 250 Park Ave., New York 17, N. Y.

Molding machines. Specifications, uses, etc., for a line of injection, compression, transfer, and reinforced plastics molding machines. Bulletin 6030-B. 6 pages. *The Hydraulic Press Mfg. Co.*, Mount Gilead, Ohio.

Copper-clad laminate. Physical, mechanical, and electrical properties; dimensional data on thickness of the copper foil and overall sheet size; results of bond strength; hot solder and oven testing for heat resistance, and insulation resistance tests; and other technical data for Grades 320-R and 320-E, a new hot-punch copper-clad laminate. Bulletin 3.18.2. 2 pages. *Taylor Fibre Co.*, Norristown, Pa.

Thermocouple Data Indicator. Graphic calculator gives millivolt values for different types of thermocouples; conversion of B&S wire gage into millimeters and decimal inches; pipe sizes, including outside diameters and wall thickness for standard, extra heavy and double extra heavy pipe; ISA wire type designations and color codes; maximum temperatures for common

thermocouple protection tubes; thermocouple polarity; Fahrenheit-Centigrade conversion; and standard C and D scale slide rule. Price: \$2.00. *West Instrument Corp.*, 4363 W. Montrose Ave., Chicago 41, Ill.

RP pipe. General description, chemical resistance, versatility, properties, uses, etc., for a line of fibrous glass-reinforced armored pipe that is used for chemical corrosion control. Bulletin FRP-1. 4 pages. *Hayeg Industries Inc.*, 900 Greenbank Rd., Wilmington 8, Del.

Smoothing and polishing media. Specifications, uses, case histories, etc., for a line of resilient rubber bonded abrasive wheels, points, and sticks for micro-deburring, smoothing, and polishing plastics and other materials. 26 pages. *Cratex Mfg. Co.*, 1600 Rollins Rd., Burlingame, Calif.

Nylon bobbins, washers. Specifications, uses, and features of a line of nylon bobbins and washers. 4 pages. *Cosmo Plastics Co.*, 3239 W. 14th St., Cleveland 9, Ohio.

Polyolefin moldings. Block and rod sizes, weights, prices, etc., for a line of large polyolefin moldings, used for neutron moderation and shielding, product prototypes, and for original equipment components. 4 pages. *American Agile Corp.*, P. O. Box 168, Bedford, Ohio.

Mylar film. Physical strength, chemical resistance, thermal range, dielectric strength, properties, applications, and other data, for Mylar polyester film. 8 pages. *Cadillac Plastic & Chemical Co.*, 15111 Second Ave., Detroit 3, Mich.

Heat sealing of PE film. Technical data sheet lists the problems, causes, and corrective measures in heat sealing polyethylene film. 2 pages. *U. S. Industrial Chemicals Co.*, 99 Park Ave., New York 16, N. Y.

Value Analysis of Printed Circuits. Booklet outlines the several functions that may be performed by the printed wiring board and describes the types of circuitry best adapted to this method of packaging as well as those where it shows up less favorably. 16 pages. *Arthur Ansley Mfg. Co.*, New Hope, Pa.

Polyethylene. Properties, applications, prices, etc., for a line of high-

medium-, and low-density polyethylene resins. 4 pages. *Phillips Chemical Co.*, Bartlesville, Okla.

Accumulators. Brochure explains why and how accumulators are used in a variety of hydraulic systems. Includes technical data on piston-type accumulators ranging in capacity from 10 cu. in. to 10 gallons. Bulletin 1530B1. *Parker Hydraulics Div.*, *Parker-Hannifin Corp.*, 17325 Euclid Ave., Cleveland 12, Ohio.

Melamine. Specifications, analytical methods, packing, physical properties, chemistry, applications, references, and bibliography for this company's melamine. 26 pages. *British Oxygen Chemicals Ltd.*, *Bridgewater House*, Cleveland Row, St. James, London SW1, England.

Speed variator. Features, dimensions, applications, hp. ratings, etc., for Paramatic Speed Variator, which is used for a variety of drive applications in the plastic, rubber, and other industries. Bulletin GEA-7012. 8 pages. *General Electric Co.*, Schenectady 6, N. Y.

ABS resins. Types available, prices, colors, etc. for Cycolac acrylonitrile-butadiene-styrene resins for molding, extruding, calendering, and vacuum forming. 6 pages. *Marbon Chemical, Div. of Borg-Warner*, Washington, W. Va.

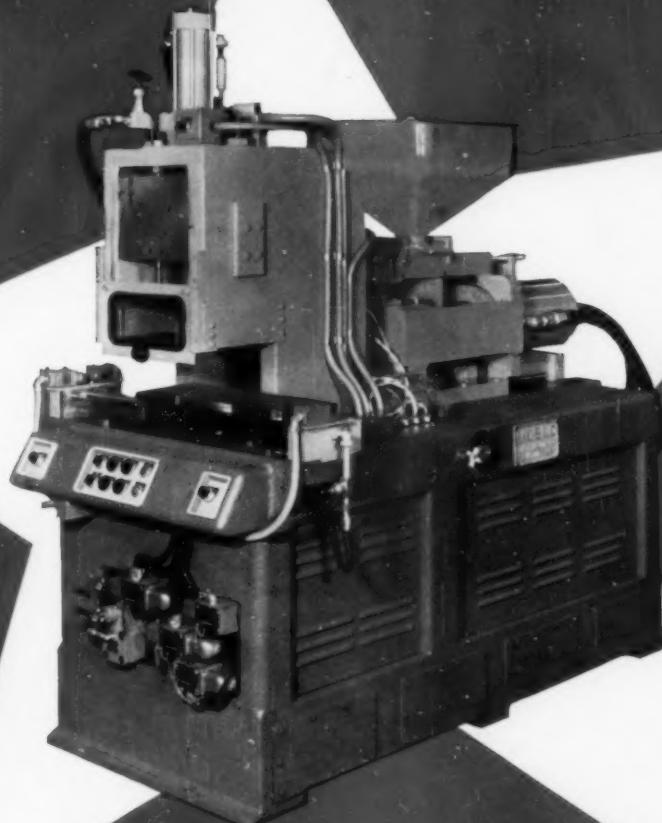
Reinforced phenolic laminates. Specifications, tensile test and flexural bending data, and other technical data relating to TRC-X reinforced phenolic laminates. 2 pages. *Riverside Plastics Corp.*, 220 Miller Rd., Hicksville, N. Y.

Hardness testers. Specifications, accessories, uses, etc., for a line of motorized hardness testers which provide both regular and superficial Rockwell hardness testing in a single machine. Bulletin CRS-60. *The Torsion Balance Co.*, Clifton, N. J.

Hydraulic presses. Specifications, features, uses, etc., for a line of hydraulic presses. Includes 125-ton plastic molding press; 80-ton plastic trim press. 8 pages. *St. Lawrence Hydraulic Co.*, 22043 Van Born Rd., Taylor, Mich.

Olefins product guide. Tabulates physical properties for 1,3-butadiene, ethane, ethylene, methane, propylene, biphenyl, dicyclopentadiene, naphthalene, tetrahydronaphthalene, toluene, unsaturated oil, calcium hydroxide, calcium oxide, acetylene, and calcium (To page 175)

A NEW STAR IS BORN!



Mr. Buyer, here is a Plastic Injection Molding Machine that you can't afford not to investigate . . . Part production and design-wise, it's the newest machine to come "down the pike" in a long while.

The Model 12 "Duplomatic" can produce heavy duty electrical cord plugs, axial switches, condensers, wiring harnesses and other parts requiring insert molding. Its versatility makes it possible to produce a great variety of industrial and commercial parts . . . A new catalog, complete with design features and specifications is yours for the asking . . . write, wire or phone.

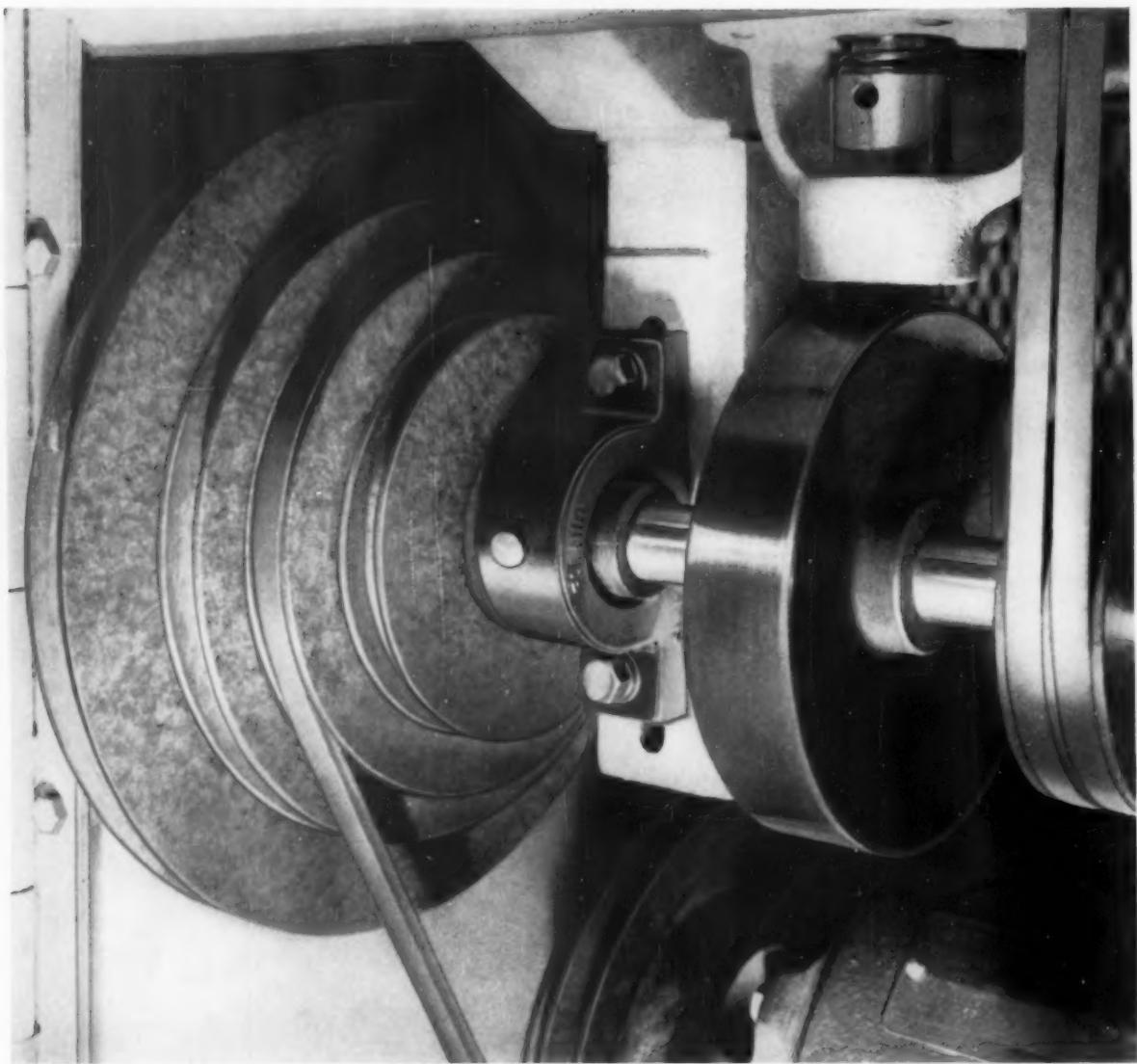
NEW MOSLO MODEL 12 FEATURES:

- ★ Four to six ounce capacity molding in a full range of thermoplastics, including Nylon and Vinyl.
- ★ Insert molding with only one operator.
- ★ Ten new major machine design features.
- ★ Excellent for second color molding.

MOSLO MACHINERY COMPANY

2442 PROSPECT AVE. • CLEVELAND 18, OHIO
A manufacturer of the World's finest Plastic Injection Molding Machines





FAIR EXCHANGE—These phenolic molded counter shaft pulleys are used by Hardinge Brothers, Inc. of Elmira, New York on their precision lathes, milling machines and chucking machines. These Hardinge machines in turn are used extensively in the plastics industry. Hardinge Brothers, Inc., one of the leading builders of precision machine tools, adopted these pulleys primarily for their lightness in weight (approximately one-half that of aluminum) for their great strength, their resistance to wear, their ease on belts, and their low cost ratio. The pulleys are a Synthane grade C macerated phenolic molded part made by the Synthane Corporation of Oaks, Pennsylvania. They are made with fabrics produced by Mount Vernon Mills.

This is another example of how fabrics made by Mount Vernon Mills, Inc., and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

UNIFORMITY
Makes The
Big Difference
In Industrial
Fabrics



Mount Vernon Mills, inc.
A LEADER IN INDUSTRIAL TEXTILES



SELLING AGENTS

Main Office and Foreign Division: 40 Worth Street, New York, N.Y.

Branch Offices: Chicago • Atlanta • Baltimore • Boston • Los Angeles

carbide; outlines methods of shipment for each product. 4 pages. *Union Carbide Olefins Co., 30 E. 42nd St., New York 17, N. Y.*

Sheets, rods, tubes, and film. Catalog gives sizes, prices, etc., for a complete line of Plexiglas, vinyl, acetate, phenolic, nylon, Teflon, Kel-F, polyethylene, polystyrene, Rexolite, and Delrin sheets, rods, tubes, and film. 64 pages. *Commercial Plastics & Supply Corp., 630 Broadway, New York 12, N. Y.*

Laminated Plastics Selection Guide. Part A—"How to Specify and Order High-Pressure Laminated Plastics." 12 pages. Part B—"Characteristics Chart of Laminate Grades." 6 pages. *Taylor Fibre Co., Norristown, Pa.*

The Resistance of Sheet Insulation to Surface Discharges. The resistance of thin materials to breakdown by surface discharges has been examined by three methods at temperatures between 20 and 140° C. Majority of tests were made on thin films of eight plastic materials, but a few tests on thicker sheets of silicone rubber, Perspex, and synthetic resin bonded laminates are also reported. Technical Report L/T379. Price: \$2.25. 30 pages. *The Electrical Research Assn. Laboratory, Cleeve Rd., Leatherhead, Surrey, England.*

Blow molding machine. Specifications, air and electrical requirements, features, etc., for dual-manifold blow molding machine. Bulletin 291. 4 pages. *F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa.*

Temperature and pressure recorders. Features, pressure and temperature elements, dimensions, specifications, etc., for a line of pressure and temperature recorders. Catalog 800. *U. S. Gauge Div., American Machine and Metals Inc., Sellersville, Pa.*

Injection molding machine. Specifications, features, and case histories for NATCO injection molding machine. Bulletin 1000. 12 pages. *National Automatic Tool Co. Inc., Richmond, Ind.*

Silicones. Engineering guide to the forms, properties, and applications for a line of silicones. 16 pages. *Dow Corning Corp., Midland, Mich.*

Hot-melt, water soluble compounds. Cost and time analysis, uses, etc., for a line of hot-melt, water-soluble compounds for producing mandrels for the fabrication of reinforced plastics ducts, filament wound pressure vessels, and (To page 177)



AN INEXPENSIVE, FULL-SIZE POOL . . . easy to erect . . . easy to maintain . . . strong enough to take a beating from athletic youngsters . . . light enough for a family to disassemble and store.

To produce a safe, family-size pool at a fraction of the cost of a permanent pool, the Hettrick Manufacturing Company of Toledo required a light, rigid and inexpensive frame to support a coated-nylon 9400 gallon tank.

POLYETHYLENE FRAME PANELS OF SEILON ETH-R provided the answer. Hettrick found this high density, linear polyethylene ideal for sturdiness, low cost and chemical resistance. Laced to steel tubing, these white Seilon wall panels make Hettrick Playpools attractive, strong, inexpensive, and extremely easy to assemble.

SEILON is versatile in its many properties and tailor-made adaptability to your requirements. We welcome the opportunity to help solve your problems—a letter or phone call will start us working.



WERNER & PFLEIDERER

serve the world's Plastics Industry presenting the original
Twin Screw Devolatilizing Dispersion Extruder

Type ZSK 120/1500
4 3/4 inches dia, 200 HP

with these unique
design features:

Self-cleaning screws for
colour-changes without
opening the machine

Kneading disks (also self-
cleaning) for maximum
Kneading and dispersion effect

Interchangeable screw elements
for variable screw characteristics
in adaptation to the requirements
of the product

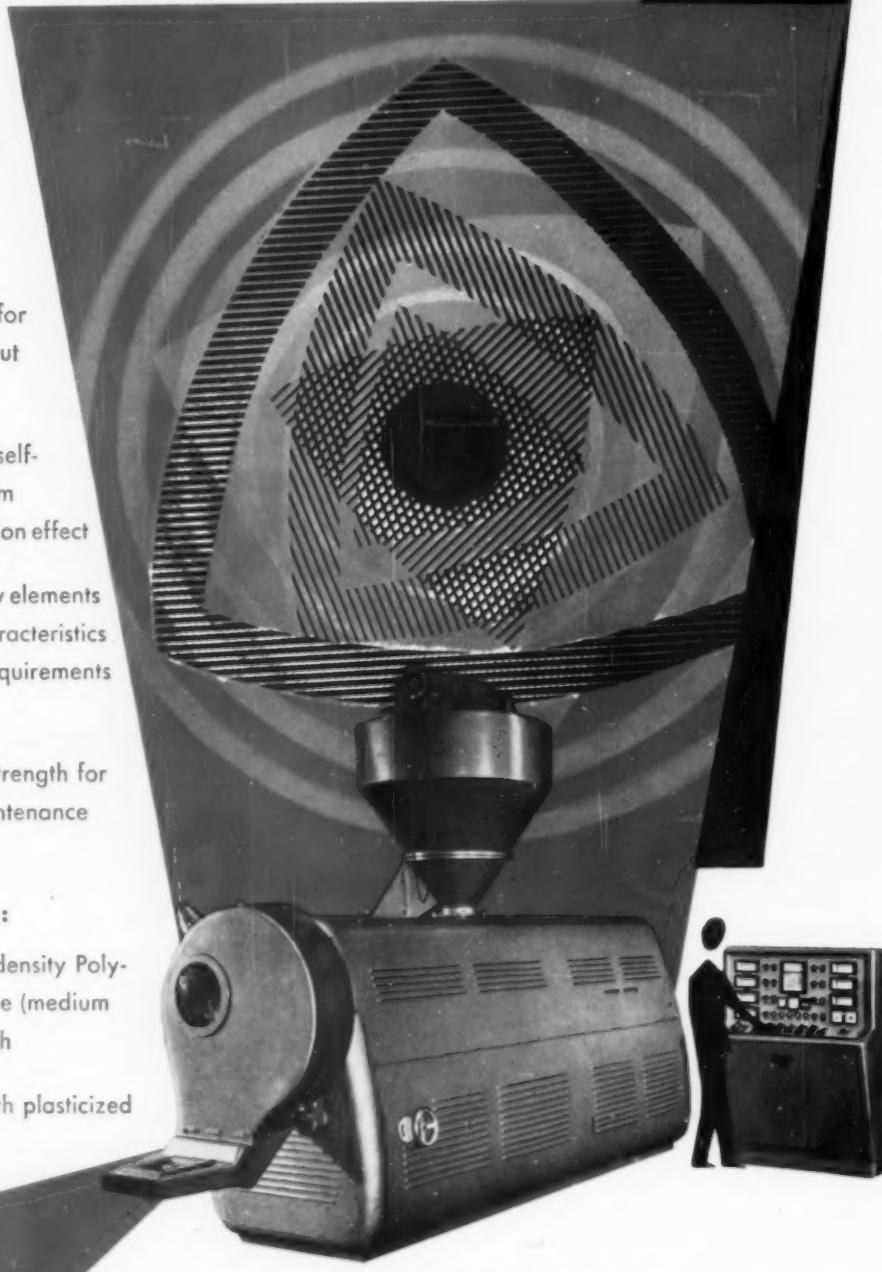
Surplus mechanical strength for
dependable low-maintenance
operation.

Some performance data:

Compounding High-density Poly-
ethylene, Ziegler-Type (medium
melt index) 1300 lbs/h

Calender-feeding with plasticized
PVC: 2500 lbs/h

53A/60



Sales and Service for the United States:

WERNER & PFLEIDERER CORPORATION

500 5th Avenue, New York 36, N. Y., Tel. LAckawana 4-0792

WERNER & PFLEIDERER - MASCHINENFABRIK - STUTTGART - WEST GERMANY

similar applications. Bulletin RPD 1000. 4 pages. Rezolin Inc., 1651 Eighteenth St., Santa Monica, Calif.

Handling C₄ Hydrocarbons. Physical properties, shipping methods and information; general unloading techniques; fire, explosion, and toxicological hazards; shipping instructions for tank trucks, cars, and barges; etc., regarding C₄ hydrocarbons. Flammable C₄ hydrocarbons require somewhat different handling facilities than do the heavier oils. 36 pages. Petro-Tex Chemical Corp., Houston 1, Texas.

Plastic lab ware. Sizes, uses, prices, etc., for a line of PE, polypropylene, polyurethane, polyvinyl, and nylon laboratory apparatus. Catalog H459. 24 pages. Dynalab Corp., 625 Goodman St. S., Rochester 1, N. Y.

Insulating resins. Thermal properties, curing method, filler, pot life, hardener, physical and mechanical properties, features, etc., for a line of epoxy and urethane resins for electrical applications. 2 pages. Marbette Corp., 37-31 Thirtieth St., Long Island City 1, N. Y.

Drum mixing equipment. Dimensions, tumbling speed, shipping weight, capacities, hp., uses, etc., for a line of drum tumblers and rollers, which are used for mixing and blending various liquids, powders, granules, and other solids. Bulletin DM-290. 12 pages. Process Equipment Div., U. S. Stoneware Co., Akron 9, Ohio.

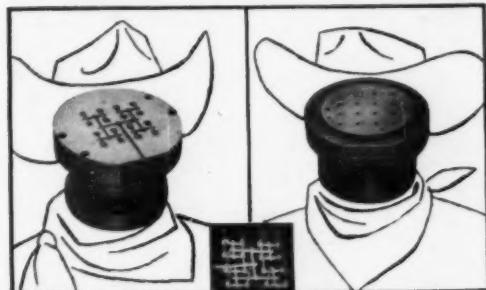
Portable pneumatic unloader. Dimensions, uses, and features of the Portaflow portable pneumatic unloader for transfer of all types of dry, pulverized, and granular resins and other materials. Bulletin 126-B. 4 pages. Sprout, Waldron & Co. Inc., Muncy, Pa.

Self-locking fastener. Thread and hole size, length, inserting force, holding power, screw size, uses, etc., for the Torq-Loc screw insert, which is used in plastics and other applications. 2 pages. Torq-Loc Div., Bergen Laboratories Inc., Paterson, N. J.

"Noise Reduction and Bar Stock Protection with Byers PVC Stock Tubes" contains "before" and "after" results of an installation in which PVC stock tubes replaced metal stock tubes on a 6-spindle automatic screw machine. Machine shop noise can reportedly be reduced from 83 to 88% with this system. 8 pages. A. M. Byers Co., Clark Bldg., Pittsburgh 22, Pa.—End

WANTED

TOUGH ASSIGNMENTS



★ We're top skilled hands, pardner. Wanted just about everywhere for tackling tough mold design jobs with complicated parts. Got a job requiring top precision—close tolerances, undercuts, intricate coring, internal threads, part-to-part uniformity? We're at your service with creativity, imagination, superlative engineering skill. Call, or write us for help, or details.

Signed,  **G-W Plastic Engineers, Inc.**
Dept. MPL-1, Bethel, Vermont.

Your fast way of pre-determining the weathering qualities of a Plastic is in the ATLAS WEATHER-OMETER®

Test for resistance to sunlight, moisture, and thermal shock.

Results are accurate and reliable and can be reproduced precisely over and over again. The Weather-Ometer furnishes a yard stick to measure the improved quality of a plastic in development and to maintain a standard of quality in production.

Automatic control of light, moisture, and temperature, can be set for repeating cycles according to the test program selected. A year of destructive weathering can be reduced to a few weeks of testing in the Weather-Ometer.



For Color Fastness only — use the Atlas Fade-Ometer®. Fully automatic in operation.

Write for technical information and recommendations for your particular problem.

ATLAS ELECTRIC DEVICES CO., 4114 N. Ravenswood Ave., Chicago 13, Illinois



WATLOW

the
hottest band
 for the
plastics
industry!

*Narrow-Band
 Cylindrical Units...

FIREROD®
 Cartridge Heating Units...

Strip / Immersion &
 Tubular Heating Units

WATLOW
 Electric Manufacturing
 Company

1364 Ferguson Avenue
 St. Louis 14, Missouri



New Machinery

(From pp. 48-54)

two 4½ v. dry cell batteries. Price \$275 f.o.b. mfr. The Simco Co., 920 Walnut St., Lansdale, Pa.

Web press

Adapted to plastic, paper, and metal stock, Model P-50 die cutter handles a 50-in. web width of stock in thicknesses from 0.0005 in. to any thickness that is available in web or roll form. The P-50 has speeds up to 200 platen strokes/min. and at its maximum, with automatic sheeter, is capable of producing 12,000 sheets—50 by 50 in. per hour. This web size makes it possible to produce more individual pieces per stroke and also permits the handling of very large pieces. Waste is held to a minimum. Low-cost steel rule dies that will produce millions of pieces are used. The P-50 can be furnished with printers for printing both sides at one time or one side in one or more colors. Embossing equipment, stitchers and gluers are also available. In addition to the Model 50, presses also come in 12 in. and 24 in. web width sizes. Karr Engineering Service Inc., 2920 W. Clybourn St., Milwaukee, Wis.

Linear speed control

A new type of control for Graham transmissions used on extruders provides equal changes in speed for equal increments of control adjustment. This new control, while providing linearity, also insures high-accuracy setting and holding of speed over a range from any desired maximum to zero—plus reverse if desired. A roller carrier, fixed to the motor shaft, supports three tapered rollers which are engaged by an encircling traction ring. Pinions fixed to the large end of the rollers engage a ring gear joined to the output shaft. To change speed, the traction ring is moved lengthwise of the transmission, engaging the rollers at varying diameters. The control cam produces equal speed

changes for each increment of movement of the micrometer control handle to provide control linearity. Once set, the transmission holds speed with change in load. Regulation is comparable to that of an induction motor. Because traction between ring and rollers is developed centrifugally, drive speed may be changed while running. Differential action makes possible stalling of the output shaft (as would be caused by jam or overload) without damage to the rotating parts. Skid or slippage cannot occur at one contact point and the transmission thus protects both itself and the driven machine against overload damage. The transmission is available with or without motor. It can be furnished with built-in spur reducers having parallel shaft extension or with worm reducers with right angle extension. Micrometer, remote mechanical, electrical, or pneumatic controls may be specified. A photograph of the unit appears below. *Graham Transmissions Inc., Menomonee Falls, Wis.*

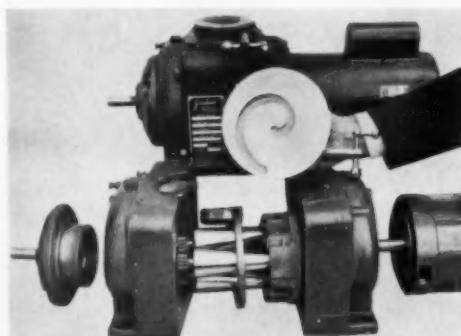
Mold release

Called Super "A" silicone mold release, this material is described as a release for all types of resins used in laminating, casting, and pressure molding. It comes in a 20-ounce pressure can for convenient spray application. It is heat-stable, oxidation resistant, and virtually non-volatile. It is suited for use on prepared non-metallic surfaces and metallic surfaces up to 500° F. and gives clean, easy release to a wide variety of plastics, including epoxy, melamine and phenolic resins. Swivel action handles for the pressure cans are also available from the company. *Hastings Plastics Inc., 1551-12th St., Santa Monica, Calif.*

Casting oven

Designed to eliminate air and moisture from plastic castings by allowing the pouring to be done under vacuum, this oven is designed to accommodate four or more molds. These are placed on (To page 180)

GRAHAM linear variable speed transmission showing tapered rollers which drive friction ring and control cam.



For
Improved
Profile
EXTRUSION

BLACAR[®] PVC RESINS & COMPOUNDS!

BLACAR means . . . laboratory-tested . . . production-proved . . . fast, uniform, highest-quality extrusions.

There is a BLACAR compound for your special extrusion needs — for your injection and transfer molding — for all your compound applications.

BLACAR Standard and Custom Compounds are used in garden and sprinkler hose — wire and cable insulation and jacketing — clothesline — flexible lamp cord — welting — tubing — shoe heels — etc., etc.

Available in standard and special colors tailored to your specific requirements.



BLACAR MEANS THE FINEST IN
PVC RESINS AND COMPOUNDS.
BLACAR Means CARY

Mail address: P.O. BOX 1128, NEW BRUNSWICK, N. J.

Plants at East Brunswick, N.J., Flemington, N.J., and Woodside, L.I., N.Y.

VINYL RESINS — VINYL COPOLYMERS — VINYL COMPOUNDS — SPECIALTY WAXES — HIGH MELTING POINT SYNTHETIC WAXES



Nacromer®
SYNTHETIC PEARL ESSENCE
BRINGS OUT THE
Beautiful
BEST IN
Vinyls

Many manufacturers and processors of vinyl films and calendered sheeting have already discovered that Nacromer adds immeasurably to the beauty of their products. By creating an entirely new character for the plastic, or by highlighting surface effects, Nacromer is finding effective use in upholstery and drapery fabrics, wall coverings, floor tiles, rainwear, footwear and shoe accessories, and many other products. Incorporated directly in the plastic or used as a coating, Nacromer may improve the visual appeal of your product too. Are you ready to try it?



**FREE 8-PAGE
HANDBOOK**

This valuable guide to the use of natural pearl essence and synthetic pearl pigments is yours for the asking.

THE MEARL CORPORATION
World's leading producer of pearl essence
14915 Woodworth Ave., Cleveland 10, Ohio

individual tables which can then be positioned for filling from the outside. The casting material can be catalyzed and put into pouring cup, heated, de-aerated, poured into mold, and finish baked. All this can be done at thermostatically controlled temperature up to 500° F. and vacuum of 29 in. or more. The unit is jacketed for oil transfer heating. Oven has porthole-type front window, direct-reading heat and vacuum gages, and electric control switch. Controls, gages and oven entry are at front. Metallizing Co. of America Inc., 3520 W. Carroll Ave., Chicago 24, Ill.

Drill press

For postmolding fabrication of plastic parts, this air power feed drilling machine operates from shop air line, with 3-in.-diameter air cylinder providing a drill thrust of approximately seven times line pressure. Feed rate is hydraulically controlled and is continuously variable. Threaded adjustable sheaves on the motor and spindle drive provide spindle speeds from 600 to 4000 r.p.m. Unit comes complete with single- or three-phase motor, air controls, worklight, and oil groove table with raising mechanism. Can be had with #2 Morse taper spindle socket or 1/2-in. chuck. Inline feed cylinder gives more thrust at the drill point for the same size bore than units feeding through pinion shaft. The Electro-Mechano Co., 241 E. Erie St., Milwaukee, Wis.

Screen separator

Separation of processed parts and tumbling media can be achieved over a broad work range with the Model SS-4L screen separator machine. Variable speed drive permits adjustment from 145 to 350 reciprocations per minute, with screen movement variable 0 to 1 1/2 inch. The compact machine is completely self-contained, motor driven, and has controlled feed with a 3 to 7° adjustable slide angle. Interchangeable square mesh screens are used, 31 by 60 in. overall. Other features include front loading and front discharge, 3/4 hp. 220/440-v. three-phase motor, simple hand-wheel speed control, and heavy duty construction. Size of the Model SS-4L is: 10 1/2 ft. long by 43 in. wide. Height of the unit to top of cradle is 44 in. above the floor. Rampe Manufacturing Co., 14915 Woodworth Ave., Cleveland 10, Ohio.

Sealing tool

For use in the lay-up of B-stage fibrous glass cloth over molds to form complex shaped parts, and in sealing plastic films, the Plasti-Form

electrically heated tool is similar to a soldering iron and consists of a heated metal tube with handle, cord and five quick-attach heads in different shapes and dimensions. The quick-change capability enables this one tool to satisfy many of the lay-up and heating requirements for any job. The heater is double sealed to prevent contamination by plastic and solvent vapors, under severe production conditions. Tests by manufacturer indicate that the nominal head temperature of 400° F. provides good heating for most materials under all operating conditions, and that a temperature control is not necessary, since adequate control is obtained by adjusting the pressure and application time. Price complete with heads, \$14.95 postpaid. ERA Engineering Inc., 1009 Montana Ave., Santa Monica, Calif.

Vacuum gage

For use in plastic metallizing equipment, battery-operated, transistorized vacuum gages with ranges of 0 to 1000 microns of mercury or 0 to 20 millimeters of mercury are available in portable or panel-mounted models. These gages provide continuous, rapid measurement of the pressure of a gas under vacuum. All models have an accurate, sealed, electrical indicating meter which reads pressure directly. Continuous readings may be made without affecting the pressure in the system. All models have a spring-loaded On-Off switch to prevent battery drain when the instrument is not in use. The gage tubes connect to the vacuum system by means of a standard 1/8-in. NPT male pipe thread. Matched and interchangeable gage tubes allow the user to monitor at multiple gage tube locations with one indicator, without recalibration or resetting of the instrument. Hastings-Raydist Inc., Hampton, Va.

Band heater

Ceramic insulated band heaters for injection molding and extruders are designed to meet the demands for higher processing temperatures. Since heat transfer is by radiation in contrast to the conventional conduction heaters, the temperature of the resistance wire is not affected by the part being heated or the manner in which the heater is installed. Pressure on the heating surface is not required. Service life has been reported to exceed 15,000 hours in most industrial process uses. Complete flexibility of this heater permits it to be attached to the component it is to heat, and eliminates the need of "two-half" or "hinged" assemblies. Heaters are (To page 183)



You can tell a DYLENE® polystyrene handle by the company it keeps

On the most famous brands of portable radios, projectors, sewing machine cases, record players and luggage you will find a good looking, colorful handle of DYLENE polystyrene. Names like General Electric, Philco, RCA Victor, Reliable, Singer, Trojan Luggage Company, Webcor, and Zenith are happy to put a handle of DYLENE in the hands of their customers. The handle shown was molded by Bruce Molded Plastic Products, Inc., Pittsburgh, Pa. DYLENE can withstand strain and impact, has good shock and abrasion resistance, and can be molded in any color with a variety of surface textures. Handles of DYLENE are dimensionally stable and their clean contours make the fitting of handles to hardware a fast, easy procedure. Koppers plastics engineers can help you select from 12 formulations of DYLENE or from other Koppers plastics. For more information, write to Koppers Company, Inc., Plastics Division, Dept. MP-60, Pittsburgh 19, Pa. Offices in principal cities • In Canada: Dominion Anilines and Chemicals Ltd., Toronto, Ontario.

KOPPERS PLASTICS



DYLITE® expandable polystyrene, SUPER DYLAN® polyethylene and DYLAN® polyethylene are other fine plastics produced by Koppers Company, Inc.

DAKE laboratory presses...

for short-run requirements

General Features:

Hydraulic pumping unit completely enclosed in base.

All-steel welded construction. Maximum rigidity for accurate work.

Bronze bushing in piston guide. Reduces wear on precision-machined parts.

Rapid advance and pressing regulated manually by air pressure.

Electric-heated platens with indicating thermostat in each platen. Thermostat range from 100 F to 650 F.

Dake air-operated, hydraulic laboratory presses are especially designed for laboratory testing and experimentation, and small parts production. They are low in cost, compact in design, and simple to operate. Like other Dake presses, these presses are engineered by men experienced in every phase of the plastic industry, who can help you meet special needs and requirements for every plastic molding operation. Laboratory presses are available in capacities from 25 tons to 75 tons; other presses, in capacities from 25 tons to 600 tons. Write for Bulletin No. 374.



25-Ton Dake laboratory press used to mold experimental resins in a Grand Rapids, Michigan, varnish company.

DAKE CORPORATION
648 Robbins Road, Grand Haven, Mich.



Hand-Operated
Hydraulic



Power-Operated
Hydraulic

DAKE
PRESSES



Guided
Platen



Gap Type
Presses



Movable
Frame

manufactured to specification only. Diameters can be specified from $1\frac{1}{2}$ in. up in any fractional increments—widths from 1 in. up in $\frac{1}{2}$ in. increments. Ceramic band heaters are particularly recommended where watt density in the range of 40 w. per sq. in. are required. *Industrial Heater Co. Inc., 417-19 Canal St., New York 15, N. Y.*

Mold cooler-heater

The Multi-Tem unit can be used for alternately cooling and heating molds in either injection or compression work. The unit can also be set for non-cycling operation and will control temperature between 40 and 500° F. The equipment included consists of two pumps (hot and cold), a refrigeration unit, electrical heaters, thermostats, and electrical controls. The unit is furnished with manual control on cycling but can be equipped with timers for fully automatic operation. Two large oil storage tanks are an integral part of the equipment, one for cold oil and one for hot oil. Thus, cold or hot oil can be immediately pumped to the process piping by merely switching in either tank. This eliminates the need for waiting for the entire volume of heat transfer fluid to come to the new set temperature when making changes. Unit is completely self contained and requires only electrical hook in and hose connections. A range of capacities and power voltages is available. *Application Engineering Corp., P.O. Box 334, Park Ridge, Ill.*

Sheeter

Designed for automatic cutting of sheets from all soft and semi-rigid plastic films, at production rates of up to 2300 per hr., the Kiefel sheeter is engineered to meet the requirements of both the large and small converter. Construction of the machine is such to make it suitable for installation at the discharge end of extrusion takeoff trains and calendering lines. Handling roll widths of up to 57 in. and diam. of up to 10 in., the unit automatically produces sheets in any length up to $31\frac{1}{2}$ in. within an accuracy range of $\pm 1\%$. The sheeter is powered by a 220 v., 60 cycle, $\frac{1}{4}$ hp. gearmotor and will handle gages from 0.004 to 0.040 inch. Simple to set-up and operate, the unit is particularly adaptable to short runs and allows operation by unskilled personnel after only a minimum of training. Suggested by manufacturer as means of evening out machine loadings during periods of peak production. *Leedpak Inc., 294 Fifth Ave., New York 1, N. Y.—End*

CADET ORGANIC PEROXIDES

BENZOYL PEROXIDE

LAUROYL PEROXIDE

**2,4 DICHLOROBENZOYL
PEROXIDE**

**TERTIARY BUTYL
HYDROPEROXIDE**

**METHYL ETHYL
KETONE PEROXIDE**

Your
Assurance
of the
Highest
Uniform
Performance

**Prompt Shipment from Warehouse
Stocks in Principal Cities**

Distributed by

**CHEMICAL DEPARTMENT
McKESSON & ROBBINS, INC.**

Dept. MP, 155 E. 44th St., New York 17, N. Y.

Manufactured by



CADET CHEMICAL CORP.

Burt 1, New York

**Write Now! A local McKesson & Robbins
Chemical Department representative
will be pleased to call and talk over your
Organic Peroxide requirements.**

We'll never
let the cat
out of the bag!

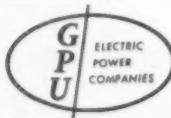


GPU *Site-Service* plant location inquiries are strictly confidential!

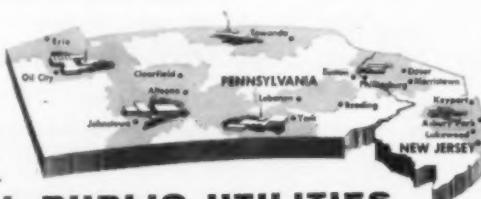
Get the jump on competition and keep your plans of relocation secret by relying on GPU *Site-Service*. Your requests for available sites and buildings will receive prompt and confidential handling without cost to you.

As the one central source of plant location information for nearly half of Pennsylvania and New Jersey, GPU *Site-Service* gives you a quick insight into the full details on any of 1279 communities within overnight shipping to more than 55 million consumers.

Write, wire or phone today for complete files on availabilities to match your specific requirements. We will be glad to send them immediately and keep your request a close secret between you and us.



Metropolitan Edison Co.
Pennsylvania Electric Co.
New Jersey Power & Light Co.
Jersey Central Power & Light Co.



GENERAL PUBLIC UTILITIES CORPORATION

Attn: Wm. J. Jamieson, Area Development Director, Dept. MP-3
67 Broad St., New York 4, N. Y. Whitehall 3-5600

Plastics Digest

(From pp. 56, 58)

lication of the article describing this rapid, reproducible, and versatile means for measuring the abrasion resistance of organic as well as several other coatings.

Selecting package cushioning. R. K. Stern. *Modern Packaging* 33, 138-45, 197 (Dec. 1959). A method for determining shock isolation characteristics of dynamic cushioning tests is described. The method is applicable to a wide variety of materials, including plastics foams, and is useful in helping to select suitable materials for specific applications.

The thermal incline as an evaluation tool in fluidized bed coating. C. J. Metz. *SPE J.* 15, 1064-65 (Dec. 1959). A method is described for use of the thermal incline apparatus in evaluating coating materials for fluidized bed operations. A description is given of the method that is used in measuring flow values at various temperatures.

Quantitative analysis of ethylene-propylene copolymers by the mass spectra of their pyrolyzates. E. Bua and P. Manaresi. *Anal. Chem.* 31, 2022-24 (Dec. 1959). A standard pyrolysis method is used to determine the composition of copolymers of ethylene and propylene. The volatile products of the pyrolyzate are examined by mass spectrometric techniques. The method is said to be quantitative to $\pm 2\%$ of the copolymer composition.

Publishers' addresses

Analytical Chemistry: American Chemical Society, 1155 Sixteenth St., N. W., Washington 6, D. C.

ASTM Bulletin: American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

Chemical and Engineering News: American Chemical Society, 1155 Sixteenth St., N. W., Washington, D. C.

Chemical Week: McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

Down to Earth: Dow Chemical Co., Midland, Mich.

Journal of Chemical Physics: American Institute of Physics, 37 E. 55th St., New York 22, N. Y.

Journal of Polymer Science: Interscience Publishers Inc., 250 Fifth Ave., New York 1, N. Y.

Kunststoffe: Karl Hanser Verlag, Leonhard-Eck-Strasse 7, Munich 27, Germany.

Materials in Design Engineering: Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

Modern Packaging: Modern Packaging Corp., 575 Madison Ave., New York 22, N. Y.

Plastics Institute Transactions & Journal: The Plastics Institute, 6 Mandeville Pl., London W1, England.

Space/Aeronautics: Conover-Mast Publications Inc., 205 E. 42nd St., New York 17, N. Y.

SPE Journal: Society of Plastics Engineers Inc., 65 Prospect St., Stamford, Conn.—End

for Pre-Planned
HIGH PRODUCTION
PRODUCT FINISHING

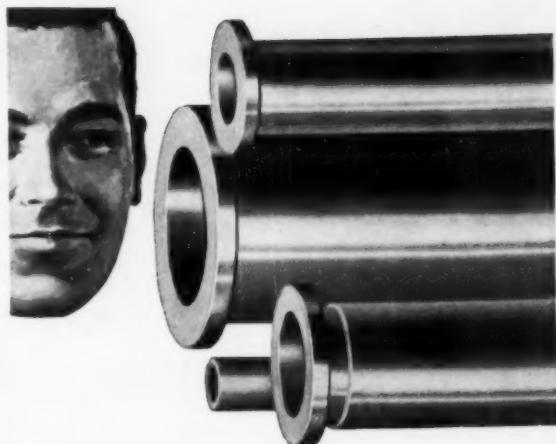


- ★ Electro-formed nickel or copper MASKS for spray decorating of intricate areas in multiple colors, one wet coat after another.
- ★ A complete line of AUTOMATIC PAINTING MACHINES for every finishing requirement.
- ★ Mechanical and air operated clamps and pressure FIXTURES for holding parts and masks.
- ★ Automatic high pressure MASK WASHERS for doubling production.

20 years of "know-how" are at your disposal. Write for brochure or send prints or sample parts, giving production requirements and results desired.

Conforming Matrix
CORPORATION
364 TOLEDO FACTORIES BLDG. • TOLEDO 2, OHIO
Call CHerry 8-3318

"CM
Quality
Tools
Produce
Quality
Products"



only Xaloy
bimetallic cylinders
can give you 25 years of proof!

For 25 years Xaloy extruder cylinders have ideally answered the corrosion and abrasion resistance requirements of the plastics and rubber industries. These integrally-bonded, mirror-smooth Xaloy linings are centrifugally-cast to provide the world's most advanced extrusion cylinders. We invite your inquiry concerning your individual specifications.

Xaloy... the original equipment
on all leading extruders
Xaloy... the logical replacement
for longest life

WRITE FOR XALOY DATA GUIDE

**INDUSTRIAL
RESEARCH
LABORATORIES**
Division of Honolulu Oil Corp.
961 East Slauson Ave.
Los Angeles 11, Calif.

XALOY
BI-METALLIC
EXTRUDER CYLINDER

XALOY
BI-METALLIC
EXTRUDER CYLINDER



Tumb-L-Matic Type XL units are designed for fast and efficient deburring, cutting down, smoothing and burnishing using the wet process.



For more detailed information on Type XL units or other Tumb-L-Matic equipment, supplies or processes, write:

TUMBL-L-MATIC, INC.
20 St. Mary's Street, Stamford, Conn.

SEALSKIN®



ROLL COVERINGS



GIVE



EXTRA LONG



SERVICE



**deep embossing
shallow embossing**

For deep or shallow embossing of supported vinyl film and unsupported film over .008" thick, SEALSKIN roll coverings are giving excellent service. One reason is its outstanding resistance to high temperatures. Ask for Bulletin S-1 which describes SEALSKIN.

Other S-W advances in roll covering ...

RELEASE® — for poly laminating. Good release — no sticking. Takes temperatures up to 400° F.

PLASTILOY® — for high temperature fusing and laminating operations.

**Talk with the man from S-W when you want to learn about current progress in roll covering.*



STOWE-WOODWARD, INC.

Newton Upper Falls, Mass.
Neenah, Wisconsin. Griffin, Georgia.

on the West Coast • **HUNTINGTON RUBBER MILLS, INC.**
Seattle, Washington • Portland, Oregon • Port Coquitlam, British Columbia, Canada

"How to Get Longer Life from a Rubber Covered Roll" — will be sent to you upon request.

Boom ahead

(From pp. 87-91)

But much of the future business in expandable polystyrene moldings does not require such elaborate equipment. Undoubtedly, many companies will be able to start in a modest way with relatively small investments. It is generally felt that sufficient capital should be available for the installation of six presses within a short time—some molders now operate up to 120 presses and do a volume of about \$125,000 a month—so that around \$70,000 would represent an average minimum initial investment.

Applications and markets

About five years ago, expandable styrene foam found limited markets in such fields as insulation, flotation, containers, furniture, and packaging. Reports on these developments have been published in MODERN PLASTICS and are summarized on p. 193.

Now we are at the point of breakthrough. In the next few months, bigger pieces and much larger volume uses will spring up in all major fields of application. Here are some examples: An 11-ft.-long boat with a 38-in. beam molded in one piece, with the hull weighing 30 lb., capable of supporting 500 lb., is produced by Worcester Moulded Plastics Co. and marketed by Snark Products Inc., New York, N. Y. Called the Sea Snark, it sells for \$99.75. The sail is made of Koppers' Durethane 5-mil-thick PE film. Another marine use, supplied by Gilman Brothers, is molded flame resistant inner cores, coated with epoxy resins, for use in lifeboats.

The cooler and ice bucket market is expected to consume 5 million lb. of beads in 1960. In the pipe insulation field, T's, unions, and elbows complement the molded pipe jackets.

In air conditioners, current uses include the insulating base and drain pan. Worcester supplies a 4 lb./cu. ft. density tray that costs less than a molded tray made from thermoplastic materials.

Really exciting possibilities are opening up in the packaging field, where molded expandable polystyrene foam has proved cheaper

smells?

CALL ON RHODIA "ODOR ENGINEERING" TO SOLVE YOUR MALODOR PROBLEMS IN PLANT OR PRODUCT

Rhodia Inc. is the world leader in industrial odor control and reodorization technology and a primary producer of industrial aromatic chemicals. It offers fully qualified consultation service anywhere in the United States without cost or obligation.

Rhodia Alamask products are in use in virtually every industry to control malodor problems of stack gases, ex-

haust fumes, and plant effluvia effectively and economically. Rhodia "odor engineering" has also created greater market acceptability for wide range of finished products through the neutralization of unpleasant odors and/or the addition of pleasing and appropriate fragrances. Why not call or write Rhodia today about your problem, or use the coupon for additional information.

89-4

RHODIA INC.
60 East 56 St.
New York 22, N. Y.

Gentlemen:
Please send me Rhodia literature. My problem is:
(please give specifics)

NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____

RHODIA

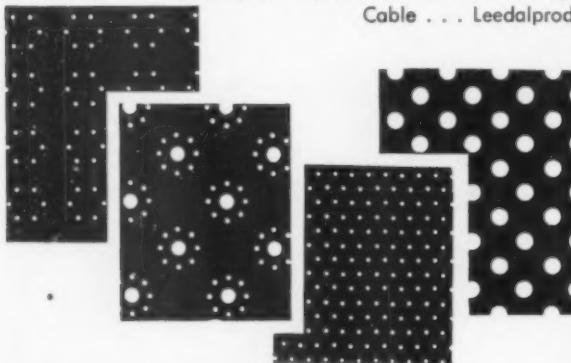
INC. 60 East 56 Street, New York 22, N. Y. (Phone: PLaza 3-4850)

PERFORATIONS

... TO SUIT YOUR NEEDS

For ornamentation and technical purposes

Complete range of patterns . . .
hole-sizes from invisible to 3/16" diameter.
Vinyls, acetate, polyethylene, cellophane, mylar, plastic-
coated fabrics, paper, rubber, etc., in sheet or rolls.
Send us a sample of your material, stating width and
quantity, for a quotation and a free catalog.
Cable . . . Leedalprod



PERFORATED SPECIALTIES CO. INC.

351 West 35th St., New York 1, N. Y. LOnacle 3-5278

ELECTRIC OVEN. Only

\$121⁵⁰

F.O.B. Chicago

**GRIEVE-
HENDRY**
PORTABLE
ELECTRIC
OVEN



FOR
PRODUCTION
OR
LABORATORY
USE

Model CR-1
10 cu. ft. capacity—30" wide x 25" deep x 24" high. Removable shelves and drip pan.

Quick Quotations
—Prompt Delivery
—Reasonable Prices
on Ovens made to
your specifications.

Portable. Adjustable temperature control to 225°F. Fan driven forced air circulation. Uniform temperature throughout. Plugs into any 110V wall outlet—no special wiring required. Can be used in a group or bank.



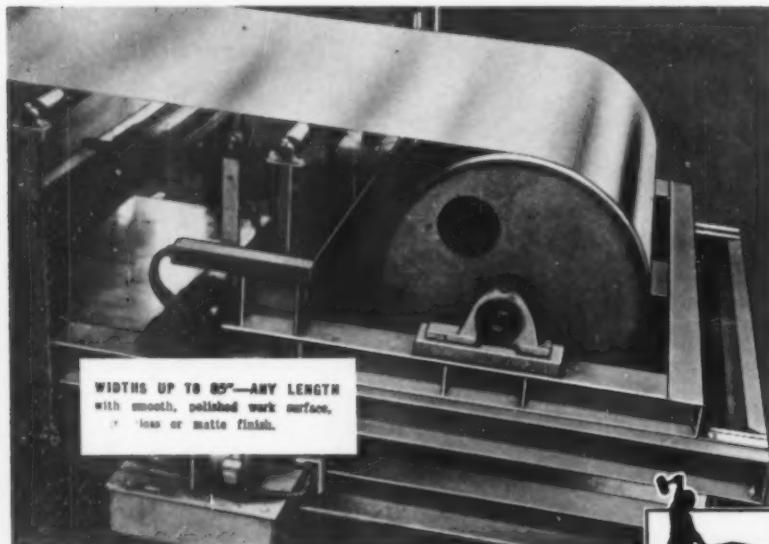
Specialists in Heat Process Equipment

GRIEVE-HENDRY CO.

1335 N. ELSTON AVE., CHICAGO 22, ILL.

Endless Stainless Steel Belt does COMPLETE processing job

Heating • hot fusing • cooling • drying
• setting • curing • surface finishing



Consult our engineers on the possibilities
for your products, without obligation.

METALSMITHS 558 White Street Orange, N. J.

Specialists in Stainless Steel Fabrication.

If you produce sheets, film, coated products, laminates, flooring, foam rubber, latex or other flat work of plastic or rubber, investigate continuous belt processing with "Metalsmiths" endless stainless steel belts. Learn how leading processors are speeding production—cutting costs—improving product quality.

"Metalsmiths" (18-8) stainless steel belts are engineered to your needs. Precision-made, high tensile strength and springlike qualities, edges hand-filed and rounded, camber held to a minimum, working surfaces polished to a smooth finish that imparts an automatic contact gloss.



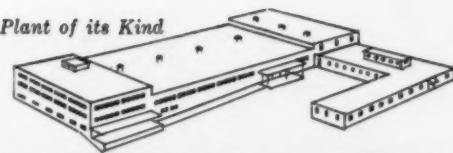
METALSMITHS
STAINLESS STEEL
ENDLESS CONVEYOR BELTS

than paperboard and glass jars. Chas. Pfizer & Co. Inc., Brooklyn, N. Y., is using foam in sample mailers, which often go into thousands of units. In some cases, the platforms are designed in three sizes to cover the company's various mailings of vials and catch covers, and to permit the use of a standard size mailer by merely changing the platform. Many die-cut paperboard parts were eliminated, neater packages and better protection of fragile items was possible, and savings in labor costs offset the higher cost of the foam material. Foampak Corp., Philadelphia, Pa., supplies Pfizer's wide range of molded foam platforms.

The same ingenuity in making basic units serve the packaging needs for a variety of different size containers is shown by The A. C. Gilbert Co., New Haven, Conn., who use five basic tiers to hold miniature apothecary jars in 10 sets of children's chemistry sets. The company has also developed more compact protective packages for its microscopes and accessories, which have merchandising and display appeal and provide quality connotations appropriate to the company's scientific kits. In Gilbert's Erector sets, molded platforms eliminated 19 laborious pinning operations previously required to keep the contents in place during shipment. These packaging items for Gilbert's broad range of educational children's kits—molded by Sulliflame Products Co., Willowgrove, Pa. and Worcester Moulded Plastics—saved about 5% waste caused by cardboard inserts which were torn during assembly operation.

Standardization of camera housings and careful mold design enable Bell & Howell to use three molds for 12 different camera models, although each foam part is fitted exactly to the product. These parts, molded by Glo-Brite Foam Plastics Products, Chicago, Ill., virtually eliminated damage in shipment and handling; cut packaging labor costs by about 50%; reduced the weight of the package by about 25%; and eliminated the use of the conventional paperboard folding carton or set-up box. General Electric Co. found that foam platforms molded by Duval Industries, Winthrop,

World's Largest Plant of its Kind



PLASTISOL HEADQUARTERS

3 reasons why...

CAPACITY

— World's largest and most modern facilities for production of polyvinyl plastisols. Big-scale production gives you up to 15,000 lbs. in one batch; quality control guarantees stability from batch to batch.

RESEARCH

— A completely equipped research laboratory enables us to custom-formulate a plastisol to meet strict specifications; often we can recommend the *right* plastisol from among the hundreds of **chem-o-sol** formulations already developed.

CHEM-O-SOL

— More than a coating or molding compound, **chem-o-sol** is a new basic material for industry. Applied by dipping, casting, spreading, molding, wiping, spraying, or pressure forming, **chem-o-sol** has vastly broadened the ways in which plastisols may be used—to make a better product, to cut production time and costs.

Send for free bulletin, to Dept. T, Chemical Products Corporation, East Providence 14, Rhode Island.

*Going Plastisols One Better... **chem-o-sol**®*

The CARVER LABORATORY PRESS

for Your
Pressing
Problems
in Plastics
R & D



The Carver Laboratory Press is standard equipment for research and development. Provides accurately controlled pressures to 24,000 lbs. Carver Standard Accessories include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment. Promptly available from stock. Write for latest bulletin.

FRED S. CARVER INC.
HYDRAULIC EQUIPMENT
3 CHATHAM ROAD, SUMMIT, N. J.





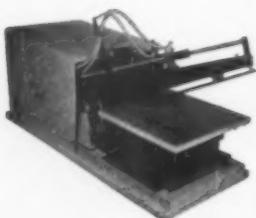
Get all the advantages of screen process marking ... with **MARKEM**

MACHINES...SCREENS...INKS...SERVICE

To mark your plastics products with *clear, durable and attractive* decorative or identifying detail, Markem offers you a *complete* answer in screen process equipment and service.

All the items illustrated were marked by Markem screen process machines, available in various models to handle many kinds of cylindrical, oval and flat products, parts, containers, novelties and other items. With these machines, Markem screens and a choice of thousands of specialty inks assure exact registration in multi-color work . . . high opacity, heavy coverage and fine detail . . . consistently high quality reproduction of designs, trademarks, identifying detail. Imprints as large as 10" x 12" can be made . . . and marking rates up to 40 objects per minute attained.

For the right machine, screen and ink for your particular job — all from one source — plus recommendations based on nearly 50 years of experience in marking and the competent local help of a nearby Markem field engineer, write Markem today. Markem Machine Co., Keene 20, N. H.



MARKEM

EVERYTHING INDUSTRY NEEDS . . . FOR PROFITABLE MARKING . . . SINCE 1911

Mass., for shipping lightmeter mechanisms, were less expensive than injection molded containers; had more rigidity and lower cost than vacuum formed items; and less weight, no moisture content, and more resilience than wood. Because of the convenient size and configuration, the foam parts proved to be the most economical shipping method and they can also be used as in-plant pallets, or on the customer's workbenches.

For the first time, C. P. Clare & Co. Inc., Chicago, Ill., can guarantee that its delicate telephone relays will be in operating condition when unpacked, because molded expandable polystyrene foam end caps, designed by H. Honeycutt, Chicago packaging consultant, provide complete protection. Compared with die-cut corrugated and solid fiberboard innerpacks which were previously used, they also cut packaging material costs by 20%; reduced shipping cube by 15 and weight by 8 percent. They can be packed four times as fast and are unpacked twice as fast. Kalamazoo Plastics, Kalamazoo, Mich., and Illinois Molding & Mfg. Co., Chicago, Ill., mold these caps to a tolerance of ± 0.005 in., with cavities that do not contact the relays at points where they could cause damage.

An entirely new field for molded beads is about to be invaded by Colgate-Palmolive Co., who are considering replacing opal glass jars for one of their cosmetic creams with a foam jar, slightly larger than the 4-oz. glass counterpart; weighing approximately one-tenth as much; and costing 20% less. Sheffield Plastics Inc., Sheffield, Mass., who helped to attain the required mechanical strength for the threaded portion, and solved such other problems as proper lip design to avoid using a cap liner, has set up a separate container division to produce the jars and also other products in the large variety of contours that are possible through the molded foam technique.

Paper cones in high fidelity loudspeakers made by Electro-Voice Inc., Buchanan, Mich., have been replaced by expandable polystyrene, because they possess more rigidity and are light in

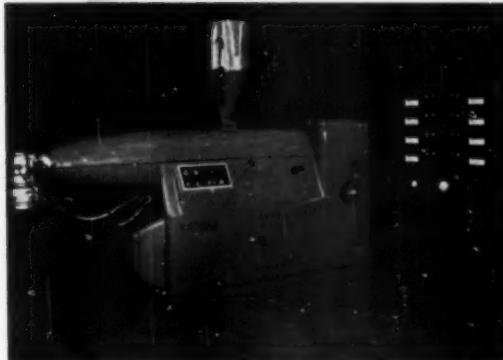
FISCHER

The oldest manufacturer of Blow Molding
Equipment in Germany

EXTRUDERS:

Screw Diameters:
1 1/4, 1 3/4, 2, 2 1/2, 3 1/2
(approx.)

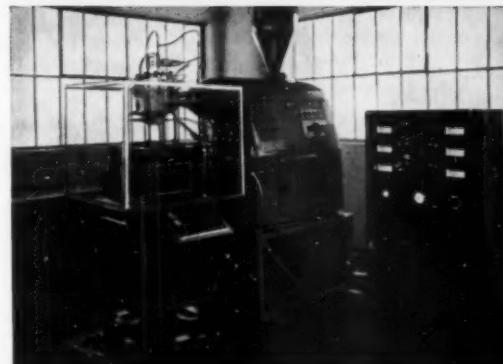
L/D Ratios:
15:1, 20:1, 25:1



BLOW MOLDING MACHINES

Model BM 500 S
Model BM 2000 S
Model BM 5000 S
Model BM 10 LTR
Model BM 60 LTR
Model BM 200 LTR

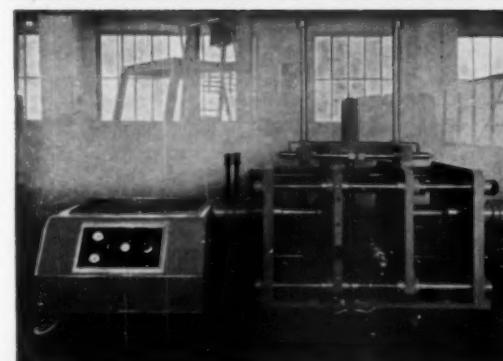
All models available
with single and double
extrusion head



FILM BLOWING EQUIPMENT

Model 1x1000
Model 1x2000
Model 2x400
Model 2x950

OTHER SPECIAL PLASTIC PROCESSING EQUIPMENT



DOUBLE FILM
BLOWING EQUIPMENT
Model 2x400

EXTRUDER
Model 90/20

BLOW MOLDING
MACHINE
Model BM 500 S

BLOW MOLDING
MACHINE
Model BM 200 LTR

Capacities up to
100 Gallons

Representative for sales and service:

BARCLAY INDUSTRIES, INC.

420 Lexington Avenue, New York 17, New York • LExington 2-0717

MASCHINENFABRIK JOHANN FISCHER

Lohmar Bez, Keln, West Germany



YOU NEVER MADE SO MUCH BEFORE!

Now, a superior way to increase
the production and profits from
compression or transfer molding presses

Thermall Preheaters are used by most compression and transfer molders. The reasons are simple! Thermall Preheaters (available in either standard or automatic models) not only represent a lower initial investment but also give superior performance. And superior performance means **increasing your production while decreasing your production costs.**

Because of its superior design, a Thermall Preheater will heat loose powder or preforms uniformly, quickly and economically and will give you day in and day out performance, around the clock, with the absolute minimum of maintenance.

With a Thermall you will get a reduction in rejects, be able to mold larger parts and increase production as much as 200% (such results have been reported from actual jobs).

YOU CAN RENT!

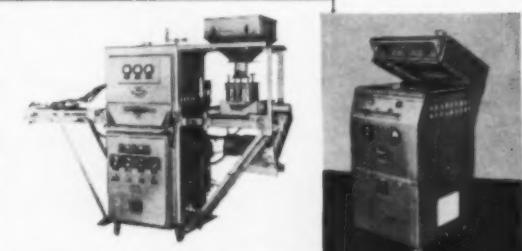
If you find that renting fits in better with your operation — rent one or more Thermall Preheaters.

Don't let another day go by without investigating this proven way to increase your production and profits, contact us now — put a Thermall Preheater in your plant on trial — see for yourself.



**W. T. LaROSE
& ASSOC., INC.**

TROY
NEW YORK



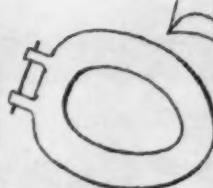
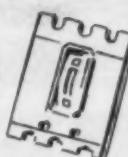
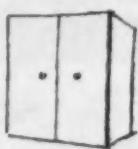
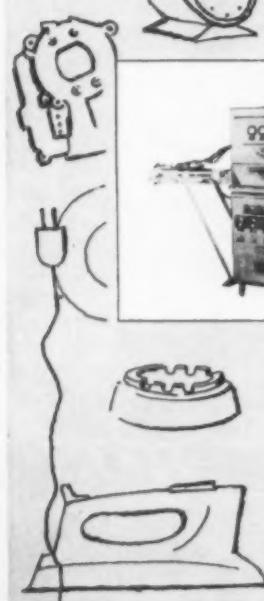
AUTOMATIC



AUTOMATIC
HOOD



UPRIGHT



weight. Other rigid materials would have been too heavy for the 30-in. diameter cones. Foam-pak Corp., Philadelphia, Pa., and Robinson Industries, Coleman, Mich., make precision-molded gaskets for phonograph and radio speakers, which are designed to replace die-cut pasteboard.

This foam has not made any impact in furniture cushioning because of its rigidity, but Gilman Brothers Co. and Plastifoam Corp. are molding the base for helicopter seats and backs, which are then covered with urethane foam.

Rayon-flocked molded novelty animal banks as premium or give-away items, produced by La Della Plastics, Fox Lake, Wis.; tunnels for hobby railroad layouts molded by Life-Like Products Co., Baltimore, Md.; and bowling pins molded by Sullifoam for Aurora Plastics, West Hempstead, N. Y.; give an indication of toys that can be made from colored or white beads, or with decorative surfaces in a wide range of contours and sizes.

With expandable polystyrene

foam products challenging billion-dollar-markets in packaging, insulation, and flotation, and consumer and proprietary items mushrooming, bead consumption for custom molded and proprietary products—other than blocks and sheets—is expected to grow from around 10 to 15 million lb. in 1960 to more than 40 million lb. within the next five years. Packaging alone will probably grow from its present two million lb. to five or six times that volume within three years. This growth will undoubtedly attract many companies that are now supplying competitive materials; and also large end users who will set up captive molding operations. But the custom molder with technical know-how, design ingenuity and a sound sales policy, will benefit by the growing acceptance of this material in established markets and in applications that will be developed as the cost saving possibilities and versatility of molded expandable polystyrene foam become more widely known.

This is the first in a series of

articles. Subsequent issues will cover foaming of "logs," injection molding, extrusion, and blow molding of expandable polystyrene foam, and high frequency energy molding.

References

The following articles in earlier issues of *MODERN PLASTICS* discuss in more detail established applications for expandable polystyrene foam:

General

"Popcorn plastics," p. 103, May 1954; "Markets in the making for rigid foams," p. 124, Oct. 1957.

Insulation

"Plastics versus heat and cold," p. 87, Dec. 1954; "Molded expandable styrene containers," p. 106, Feb. 1956; "Expandable polystyrene minnow bucket," p. 197, June 1956; "Big cold box," p. 122, May 1957; "For portable refrigerators molded styrene foam takes over from metal," p. 93, May 1959; and "No sweat with foam jackets," p. 89, Feb. 1960.

Flotation

"Styrene foam float," p. 205, Nov. 1955; "Styrene foam float and life preserver ring," p. 219, April 1956; "Unsinkable boat," p. 112, Sept. 1958; "Marine markers with endurance," p. 111, March 1959; "Expandable polystyrene flotation toy," p. 158, Aug. 1959; "Portable island," p. 86, Oct. 1959.

Miscellaneous

"Expanded styrene novelties," p. 190, Dec. 1955; "Foamed styrene for flower pots," p. 106, Feb. 1956; "Jet age crash helmet," p. 88, Aug. 1957; "More about foamed polystyrene cups," p. 39, Sept. 1958; "Display shell," p. 190, Sept. 1958; "Foamed styrene cuts missile costs," p. 167, Nov. 1958; "Foam chair frame is 2/3 lighter, 5 times stronger," p. 98, April 1959; and "Crash cap for cops," p. 77, Aug. 1959.—End

FREE CATALOG



At Savings too!

You'll find the answer to low cost small plastic parts (up to 6 oz.) in new Wilcox mold-making techniques and close tolerance molding.

WRITE FOR THIS NEW FREE CATALOG TODAY

WILCOX PRODUCTS CO.
3453 Dakota Ave., Minneapolis 16, Minnesota

CLAREMONT Flock

in Your Plastic Formulations
Insures Easier Processing,
Greater Strength,
Better Products

Claremont Fillers provide the pattern and structure for stronger plastics—without sacrificing or impeding the molding or physical properties of a formulation. All Claremont cotton fillers are exactly processed from carefully chosen stock. Strengths are graded from fine flock to macerated fabric pieces—each in its classification is certain to satisfy the desired impact requirements. Samples for laboratory test runs are available.

CLAREMONT FLOCK CORPORATION

Write for Samples

The Country's Largest Manufacturer of FLOCK

CLAREMONT, NEW HAMPSHIRE



one color
any resin

Ferro dry colors

Here's the lowest cost, easiest way to get colored resins. Buy them *uncolored* and color them yourself with Ferro high-fidelity dry colors.

Uncolored resins cost less. You color only what is needed for the job. This reduces inventory, blocks waste, saves time on rush jobs. No special equipment is needed.

Write for free booklet that tells you how.



FERRO CORPORATION
Color Division

4150 E. 56th St., Cleveland 5, Ohio • 5309 S. District Blvd., Los Angeles 22, California • Ferro Enamels (Canada) Ltd., Oakville, Ontario, Canada

Post office

(From pp. 92-94)

is based upon its clarity for full visibility, light weight, resistance to breakage, and ease of fabrication. Supplied by Cadillac Plastic & Chemical Co., Detroit, the $\frac{1}{8}$ -in. sheet stock was fabricated into 291 half-doors (each $2\frac{1}{2}$ by 10 in.) used on the 12 keyboards. Also of Plexiglas, in translucent white, are the light shields for fluorescent tube lighting used on the back side of the machine, where the destination pockets are located. Total estimated poundage of acrylic sheet in the machine is 130 pounds.

The destination receptacles, from which sorted letters are removed manually as they become filled, have bottom liners injection molded from high-impact styrene material. The ribbed design of the liners (see close-up in photo, p. 92), supports the stack of letters in an elevated position, permitting the clerk's fingers to be slipped beneath them for quick as well as convenient removal.

For the 279 destination bins, the liners required about 140 lb. of styrene material. They were produced in the Plymouth, Mich. plant of Burroughs Corp., using styrene material supplied by The Dow Chemical Co.

Each of the 12 operator consoles includes 10 finger-fitting control keys which are depressed in proper combinations to sort each letter into its destination bin. Tops for these keys, injection molded of butyrate, are produced by Burroughs in the plastics department of its Plymouth plant. In the electrical circuitry of the letter sorter, liberal use has been made of a number of plastics, including phenolic and nylon, which were selected for both mechanical and electrical properties.

In view of the hundreds of pounds of plastics involved in each letter sorting machine, and the fact that the Post Office Department will probably be ordering this type of equipment in increasing quantities as part of its current mechanization program across the U. S., the semi-automatic letter sorter represents a rather important new outlet for plastics materials.—End



For vinyl insulation that holds up under rugged service . . .

MONOPLEX & PARAPLEX PLASTICIZERS

The plasticizers listed below not only maintain very good electrical properties in your vinyl insulation, but they also stay **in** the insulation and keep its physical properties from deteriorating when the going gets rough. For instance, here are some performance characteristics of vinyls using these plasticizers . . . excellent retention of physical properties on exposure to high temperatures . . . very low plasticizer volatility . . . high resistance to migration into lacquers, baked enamels, rubber, and polystyrene . . . exceptional resistance to plasticizer extraction by water, soapy water, and oil. Also, note the key uses for the individual grades:

MONOPLEX S-90E—applications requiring retention of resistivity, tensile strength, and elongation after long-term high-temperature aging (either dry, immersed in water, or exposed to high humidity).

PARAPLEX G-54—standard appliance wire, including 105°C insulation. Has particular merit wherever 1) retention of compatibility under high humidity exposure and 2) freedom from plasticizer migration into polystyrene, rubber, lacquers, and other coatings are required.

PARAPLEX G-62—provides stabilization against heat. Ideal for high-temperature insulation. Also can be used with general purpose plasticizers to improve durability of lower-cost wire such as extension cords. Outstanding for use with PARAPLEX G-54 and MONOPLEX S-90E for improved stabilization of high temperature insulation.

We will be glad to send more detailed technical information and literature on these plasticizers. Also ask for our 13-page booklet *What You Should Know about PARAPLEX and MONOPLEX Plasticizers*.

MONOPLEX and PARAPLEX are trademarks, Reg. U.S. Pat. Off. and in principal foreign countries.



Chemicals for Industry

**ROHM & HAAS
COMPANY**

THE RESINOUS PRODUCTS DIVISION
Washington Square, Philadelphia 5, Pa.

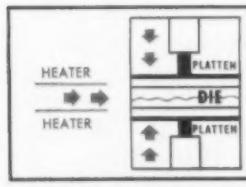


Constant and exact temperature control is easy with the BROWN closed system unit

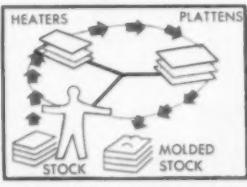
Brown Machine Company, continuing to serve the plastics industry with dependable modern equipment, proudly introduces the new TC-2 Control Unit. The Brown TC-2 is an improved recirculating closed-system temperature control unit. Its function is to maintain a stable surface temperature for all types of Vacuum Forming Molds and Sheet Polishing

Rolls within $\pm 1.5^{\circ}\text{F}$. Simple to operate, the TC-2 assures constant precise control at all times; and is extremely economical to use because of its efficient recirculation system. If you want accurate temperature control (to $\pm 1.5^{\circ}\text{F}$), with low operating and maintenance costs, let the new TC-2 unit do the job for you.

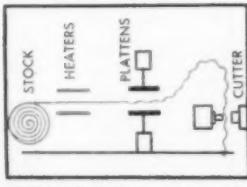
BROWN ALSO MANUFACTURES A COMPLETE LINE OF VACUUM FORMING EQUIPMENT.



2 STATION MODEL 222



ROTATING MODEL 223



CONTINUOUS MODEL 22C

FOR FURTHER INFORMATION, ADDRESS ALL INQUIRIES TO

BROWN MACHINE COMPANY • BEAVERTON, MICH.



Custom drawer

(From p. 95)

on a fully automatic Vacform 30-50, using 0.120-in. polystyrene sheet (Monsanto's Lustrex 88). The forming is a combination of male and female moldings. All of the three models are formed simultaneously using a three-cavity mold.

The formed sheet is trimmed in a specially designed shaper-jig to assure that the edge of the drawer is an arc (a straight edge on the sheet would cut into the finished edge of the case).

Quality standards are maintained at a high level. First, sheet thickness is high enough to overcome problems of cold-flow in long-term loading. And while precise data on cycle times is not available, processing conditions are designed to give a high-quality product. Robert A. Schless Jr., who is president of the processing company, made the following observations:

"In our cycling, we attempt as much as possible to pre-stress the drawer against load. This, again, is because the material has not been on the market long enough to guarantee by actual usage its use over periods of, let us say, 20 years. Therefore, to minimize risk, we will not utilize techniques which might harmfully stress and ultimately weaken the product. I refer here to cooling, as well as heating, cycles."

The new special-use drawers, an outgrowth of ideas originally developed by Monsanto and Pratt Institute of Technology, were chosen by Richardson designer Lawrence Peabody for incorporation in some of his company's case good lines.

The original Monsanto-Pratt designs were modified by Schless in order to make them structurally stronger. This was principally achieved by forming the units with peripheral, uninterrupted beam sections.

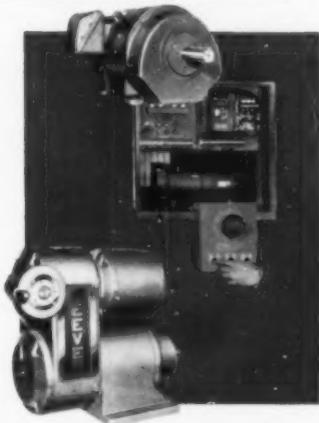
The original job was run for Richardson Bros. as a custom order, with an expiration date of July 5, 1960. From that day on, Robert A. Schless & Co. Inc. will sell these drawers as a proprietary item to all users. Retail list price is approximately \$4.—End

YOUR RELIANCE POWER SELECTOR

MOTORS and DRIVES

FOR INDUSTRIAL FORMING MACHINES

EXTRUDER DRIVES



V*5 EXTRUDER DRIVE — 1 thru 350 hp.

All electric variable speed drive operates from a-c. circuits. Standard speed ranges as great as 16 to 1, with constant horsepower available. Wider ranges for special applications. The V*5 system provides soft starts with full torque available at low speeds, and controlled acceleration.

Only the drive motor need be mounted on the extruder. All control equipment including operator's panel can be placed in any convenient location, in a new Super 'T' V*5 cabinet which is up to 35% smaller. V*5 Extruder Drives can be equipped with controls to coordinate extruders with conveyors, capstans, or other auxiliary equipment, or for automatic control of extruder output.

For full details, ask for Bulletin No. D-2506.

REEVES EXTRUDER DRIVES — 5 thru 40 hp.

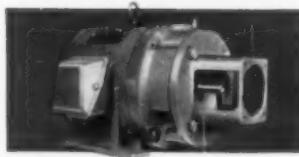
Low cost, mechanical variable speed motodrive operates from a-c. circuits. Available in speed ranges up to 8:1.

Reeves Extruder Drives are variable pitch pulley devices powered by standard a-c. motors. A simple turn of a hand wheel selects any speed in the drive range. Pneumatic controls are available for remote or automatic operations.

Low cost Reeves Extruder Drives are simple to maintain. Complete drive mounted right on the extruder, with no additional control equipment required.

For full details, ask for Catalog No. M-592.

INJECTION MOLDING MOTORS

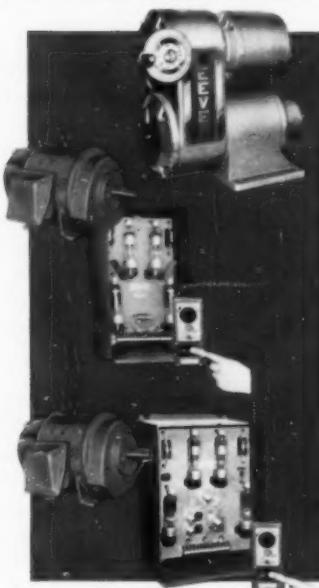


RELIANCE HYDRAULIC PUMP MOTORS — 1 thru 200 hp.

Complete line of a-c. motors designed for powering injection molding machine hydraulic systems. Available for either separate coupled shaft mounting or flange mounting as an integral part of the pump. Drip-proof; explosion-proof; dust-tight.

For full details, ask for Bulletin No. B-2104.

Winders, Pelletizers, Laminators and other auxiliary equipment drives



REEVES MOTODRIVES — 1/4 thru 5 hp. and up

Low cost mechanical variable speed drive similar to the extruder drive except lower horsepower. Available with speed ranges as wide as 10:1.

Reeves Motodrives furnish any operating speed in their range with a turn of the hand wheel. Simple operation and maintenance. Can be supplied with reduction gears.

For further information, ask for Catalog No. M-571.

V*5 Jr. DRIVES — 1/8 thru 4 hp.

An electronic variable speed drive, operating from a-c. circuits, the V*5 Jr. is similar in principle to the V*5 Extruder Drive.

The V*5 Jr. has a nominal 8 to 1 speed range, but provides up to a 20 to 1 range when lowest speeds are used for intermittent or light duty. Simple, accurate speed regulation and selection.

Minimum maintenance required, simplified with building block components.

For further information, ask for Bulletin No. D-2507.

VS-100 DRIVE — 1/4 thru 4 hp.

The VS-100 is an electronic variable speed drive similar to the V*5 Jr. Offers a wider operating speed range, providing full running power over a 100 to 1 range. The VS-100 provides excellent speed regulation. The VS-100 is also available as a winder drive which can offer constant torque winding, tapered tension winding or constant tension winding—with a simple adjustment. Stalled tension and speed limit also available. This drive is ideal for center shaft winding applications.

For full details, ask for Bulletin No. D-2501.

WHY YOU SHOULD SPECIFY RELIANCE

Reliance has a nationwide sales and service organization in 65 major industrial centers. This organization is backed up by distribution and warehouse centers in Atlanta, Boston, Chicago, Cleveland, Dallas, Detroit, Newark, Houston, Los Angeles, Minneapolis, Philadelphia, Portland, San Francisco, Seattle, Shreveport and St. Louis. You can get any standard Reliance, Reeves or Master product directly from these centers. Immediate delivery and service.

D-1631

Product of the combined
resources of
Reliance Electric and
Engineering Company and its
Master and Reeves Divisions

RELIANCE ELECTRIC AND
ENGINEERING CO.

DEPT. 156A1, CLEVELAND 17, OHIO
Canadian Division: Toronto, Ontario
Sales Offices and Distributors in Principal Cities



Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V*5 Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.

Draw one... rigid?



This is a story about FOAMS... urethane foams

EVERYONE KNOWS you can control the amount of foam on a stein of beer . . . that's easy. Controlling the action of poured urethane foam materials is also easily mastered.

But to spray foam on smooth or irregular surfaces on a commercial basis . . . that was another problem — a real problem.

So, while we were pioneering in polyether-based urethane foams, we had our business eye cocked for means of spray applying it. We discovered that a leading maker of spray-painting equipment was already alert to the great potential of urethane foams, and was more than anxious to cooperate.

Result: Solvent-blown polyether urethane spray foams became a reality. Standard, portable hot-spray catalyst equipment, which is readily available, makes the application of these new foams just as commercially practical as spraying paint.

Wherever you wish to apply urethane foams — for thermal insulation or sound dampening in freezers, refrigerators, industrial tanks and surfaces . . . in air-conditioning cabinets, ducts, or as a reinforcement for thin-gauge metal sections of aircraft and automobiles . . . or for corrosion control in industrial plants — you'll find the equipment and raw materials easily obtainable, and the results predictable.

For, it all goes back to the proved Wyandotte system: that when polyurethane components are simultaneously mixed and atomized in an air blast, foaming action takes place. This action begins immediately, even before the mass strikes the surface, and is completed in a matter of minutes.

Can you see the possibilities for profit? More than 1400 other firms and individuals have (according to inquiries received). But perhaps you're wondering, "How do I go about it to get the best results?" This will assist you:

1. If you are a prepolymer manufacturer, or are making foams for others, keep in close contact with our market-development and new-products departments.
2. If you have need for urethane foam to be applied in your plant, get in touch with a prepolymer maker or foam applicator.
3. If you make, or wish to make, urethane foams as a part of your own products or processing, write us direct, describing your requirements in as much detail as possible. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte's urethane-foam raw materials include: PLURACOL® Series of Triols, used for one-shot flexible foams and for the preparation of rigid urethane foams; PLURACOL Diols used for prepolymer-type flexible foams and to impart strength properties to one-shot flexible foams; TETRONIC® Polyols, for improved resilience and moldability; QUADROL®, a very reactive cross-linking agent and catalyst; DHP-MP, a catalyst with extremely low odor.



Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION
PACING PROGRESS WITH CREATIVE CHEMISTRY®

Vinyl fabrics

(From pp. 104-108)

involves highly volatile solvents, each unit is located in a separate room along the east outside wall and isolated from the other production processes by firewalls. The printing equipment includes two types made by Lembo, a special unit for printing or plastisol coating by Dilts, and a unit that is specially designed and built for Ford requirements.

The finished coated fabric is trucked to quality control stations, where operators using Progressive inspection equipment scan each roll 100% for visual defects as well as color matching against a master sample under simulated daylight illumination (Photo 8). Each coded roll of material is then held pending completion of physical and chemical tests to insure that it meets specifications.

Included in these checks are Weatherometer and Fadeometer tests, wear, tensile, creasing, and cold cracking tests at temperatures ranging down to -50° F., as well as others covering specific gravity, plasticizer migration, staining, gloss, color fidelity, etc. Accepted rolls are then loaded for delivery to Ford's Highland Park, Mich., plant and supplier plants where the material is converted into finished trim items by cutting, sewing, heat sealing, etc.

In the plant's extrusion department, approximately 50 vinyl welting items are produced. Two NRM extruders—a 2½-in. unit and a 3½-in. model—are used in this department (Photo 9). The two shapes made have a $\frac{1}{8}$ - and $\frac{3}{16}$ -in. bead. They are used where sewed seams are required. Upon emerging from the extrusion dies, the still impressionable welting passes over a patterned roller which gives it a surface matching that of the trim stock. For this operation, Ford compounds its own vinyl material and prepares the cubes to a matching color.

Due to the high degree of equipment integration in the Mt. Clemens plant, average production quality is very high and scrap losses are small. Practically the entire output of the plant is sold to Ford Motor Co. at prices which must be competitive.—End



Serviceable reds! Beautiful reds! with Bonadur Red Toners

Red's a favorite color in America's kitchens! And for a range of hues that brings repeat sales, many formulators insist on the two toners that always deliver uniform, *beautiful* results—Cyanamid Bonadur Red Y 20-6440 and B 20-6540!

Both Bonadur Toners are particularly suitable for polyvinyls, polystyrenes, polyethylenes and cellulosics. They assure satisfactory light and heat stability and bleed resistance, good dispersion, and minimum migration and crocking.

Discover how much color can be added to your plastics with versatile, economical Bonadur Red Toners. Your Cyanamid Pigments representative will be pleased to supply samples and additional information.

COLOR IS THE DIFFERENCE

CYANAMID

AMERICAN CYANAMID COMPANY

Pigments Division

30 Rockefeller Plaza • New York 20, N. Y.
Branch Offices and Warehouses in Principal Cities



HARFLEX® PLASTICIZERS

FOR VINYL RESINS, SYNTHETIC RUBBERS,
CELLULOSE ESTERS

Harchem offers a wide choice of plasticizers, each with special merits, all designed to keep your product young. Sebacate esters are particularly good on weathering and aging. Their outstanding features include low

temperature flexibility, low viscosity, low heat loss and maintenance of flexibility over wide temperature ranges. Consult us if you have a plasticizer problem. Our technical staff will gladly assist you in solving it.

Plasticizer	Specific Gravity 25°/25°C ±.003	Viscosity 25°C, cps	Compatible With	Outstanding Characteristics
Dibenzyl Sebacate	1.055	21-22	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers.	Low Temp. Flexibility, Low Volatility, Permanence, Good Electricals
Diethyl Sebacate	0.935	7.9	Vinyl Resins, Cellulose Acetobutyrate, Synthetic Rubbers, Rubber Hydrochloride, Polystyrene, Polymethyl Methacrylate.	Low Temp. Flexibility, Excellent Aging Qualities, Non-toxic
Dimethyl Sebacate	0.986°	3.54 @ 30°C	Vinyl Resins, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate, Acrylic Resins.	High Solvency and Efficiency, Wide Compatibility
Diethyl Sebacate	0.913	17.4	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate.	Low Temp. Flexibility, Low Volatility, Good Electricals
Dicapryl Phthalate	0.972	55	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate.	Highly Compatible, Low Volatility, Excellent Viscosity and Stability
Diisodecyl Phthalate	0.965	65	Vinyl Chloride Polymers and Copolymers, Polyvinyl Acetals, Cellulose Nitrate, Cellulose Acetobutyrate, Chlorinated Rubbers.	Low Volatility, Good Electricals
Diethyl Phthalate	0.983	57	Vinyl Chloride Polymers and Copolymers, Polyvinyl Acetals, Natural and Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate.	Highly Compatible, Good Flexibility
Isooctyldecyl Phthalate	0.973	68	Vinyl Chloride Polymers and Copolymers, Polyvinyl Acetals, Natural and Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate.	Improved Flexibility, Permanence, Good Electricals
Diethyl Adipate	0.924	21	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Natural and Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate.	Low Temp. Flexibility
Butyl Stearate CP	0.857/0.86	9.1	Natural and Synthetic Rubbers, Cellulose Esters, Polystyrene, Polyvinyl Butyral: partly compatible with Polyvinyl Chloride and Nitro Cellulose.	Lubricity, Abrasion Resistance, Low Cost, Non-Toxic
Butyl Oleate, distilled	.8685/.869 @ 20/20°C	7.2	Most Natural and Synthetic Rubbers, Polystyrene, Cellulose Nitrate, Ethyl Cellulose.	Low Temperature Flexibility, Primary Plasticizer for Chloroprene, low cost
® Harflex 300	1.096	1400 @ 100°F/cs	Polyvinyl Acetate, Cellulose Acetobutyrate, Nitrocellulose, Ethylcellulose, Polymethyl Methacrylate.	Non-Migratory, Fast Processing Low Temp. Flexibility
® Harflex 325	1.100	2000 @ 100°F/cs	Vinyl Chloride Polymers and Copolymers, Polyvinyl Acetate, Synthetic Rubbers, Nitrocellulose, Cellulose, Acetobutyrate, Polymethyl Methacrylate.	Non-Migratory, Permanent
® Harflex 330	1.081	2270 @ 100°F/cs	Vinyl Chloride Polymers and Copolymers, Synthetic Rubbers, Nitrocellulose, Cellulose Acetobutyrate.	Non-Migratory, Permanence, Highly Compatible
® Harflex 375	1.016 @ 30°/20°C	45000 @ 100°F/cs	Vinyl Chloride Polymers and Copolymers, Nitrocellulose, Synthetic Rubbers.	Extreme Permanence



HARCHEM DIVISION

WALLACE & TIERNAN, INC.
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY
IN CANADA W. C. HARDESTY CO. OF CANADA, LTD., TORONTO

- ① SELECT the items you want
- ② CIRCLE the corresponding numbers on the post card
- ③ FILL IN the information requested
- ④ MAIL — no postage required

HELPFUL LITERATURE FREE

There is valuable data — worth dollars and cents to you — in the literature and samples described below.

EQUIPMENT • SUPPLIES • SERVICES

URETHANE FOAMING EQUIPMENT. 2-page brochure outlines advantages, specifications and application of urethane foaming equipment: pumps, drives, holding tanks, piping, mixing head, delivery, air pressure, voltage and construction. Specifications. Rogers Associates Inc. (F-001)

THERMOPLASTIC EXTRUSION EQUIPMENT. 9-page illustrated catalog brochure describes features and applications of line of vented, non-vented extruders, 1" to 12" diameter. Also tested dies, accessories, blow molding equipment, take-up, conveyor, etc. Modern Plastic Machinery Corp. (F-002)

VINYL STABILIZER SERVICE. 18-page illustrated catalog folder describes features, applications of vinyl stabilizers in calendering, extruding and injection molding applications. Specifications. Harshaw Chemical Co. (F-003)

DIAPHRAGM SEALS. 20-page illustrated catalog outlines features and applications of line of diaphragm seals for protection of pressure instruments against corrosion and clogging. Also accessories for industrial control instruments. Specifications, prices. Brooks Rotameter Co. (F-004)

BLOW MOLDING EQUIPMENT. 4-page catalog folder outlines features, describes for various blow molding applications. Specifications. The Rainville Co., Inc. (F-005)

SAW GRINDING MACHINE. 46-page illustrated catalog describes features and applications of precision saw grinding machines for carbide tipped circular saw blades. Technical specifications. W. Von Arnould Co. (F-006)

PLASTIC IMITATION WOOD GRAINS. 4-page illustrated brochure describes line of plastic imitation hardwood grain reproductions designed for furniture finishes, other applications. Decar Plastic Corp. (F-007)

UNDERGROUND CIRCUIT PLASTIC COVERINGS. Single page brochure describes a semi-rigid plastic conduit designed as protective coverings for cable and underground installations. Naugatuck Chemical Div., U.S. Rubber Co. (F-008)

TRANSPARENT, FLEXIBLE, POLY-ESTER FILM. 8-page booklet shows properties and suggested applications of an acrylic, butyrate polyester film showing resistance range to chemical attack. Designed for application to electrical, packaging, decorative, stationery and other fields. Cadillac Plastic & Chemical Co. (F-009)

PLASTIC PLUGS AND CAPS. 18-page illustrated brochure describes line of protective plastic plugs and caps designed to protect products against damage in handling, storing and shipping operations. Tables, specifications, prices. Plastics Div., S. S. White. (F-010)

VACUUM COATING EQUIPMENT. 16-page illustrated brochure describes features and applications of a line of machinery and equipment designed for vacuum coating. Specifications, tables, data. NRC Equipment Corp. (F-011)

SCREEN PRINTING MACHINES. 4-page illustrated brochure describes machinery designed for combination screen printing for cylindrical, sphere and flat objects of glass, plastics, metal, wood and other materials. Specifications and data. Dependable Compressor & Machine Co., Inc. (F-012)

VACUUM FORMING EQUIPMENT. 7-page illustrated brochure describes machinery designed for vacuum forming blister-packs, contour, and skin-formed packaging, and other items. Specifications, prices. Plast-O-Craft Co., Inc. (F-013)

BLOW MOLDING UNIT. 4-page illustrated folder describes technical features of blow molding machine operated by extrusion. Specifications. Mol. (F-014)

DIAMOND GRINDING AND CUTTING WHEELS. 20-page illustrated catalog describes features and applications of a line of diamond grinding, cutting, wheels and drills. Specifications. Sample Marshall Laboratories, Inc. (F-015)

NAPHTOLS AND DYES. 2-page brochure describes features of colored dyes and naphthols for use in color styling of fabrics and surfaces. Carbic-Hoechst Corp. (F-016)

REINFORCED PLASTICS STRUCTURES AND COMPONENTS. 14-page illustrated folder describes features, properties and applications of engineered re-

inforced plastics. Fairchild Engine & Airplane Corp. (F-017)

SPRAYING, POURING AND FOAMING EQUIPMENT. 4-page illustrated catalog brochure describes features of equipment designed for use in spraying, pouring or foaming multiple component materials. Specifications. Binks Manufacturing Co. (F-018)

CUMENE HYDROPEROXIDE AND RELATED CATALYSTS. 8-page technical data folder describes properties, handling, uses and applications of cumene hydroperoxide and related catalysts. Specifications. Hercules Powder Co. (F-019)

MOLDING MACHINES PARTS REPLACEMENT. 4-page illustrated folder describes parts, repair and replacement service for plastic injection molding machines. Adco Engineering & Mfg. Co. (F-020)

EPOXY RESINS. 48-page catalog provides technical information, describes features and applications of epoxy resins. Specifications, prices. Marbette Corp. (F-021)

MOLDING COMPOUNDS, RESINS. 8-page illustrated catalog describes properties and applications of thermosetting molding compounds, fire-retardant resins for reinforced plastics, bonding and coating resins. Specifications. Durez Plastics Div., Hooker Chemical Corp. (F-022)

INJECTION MACHINE NOZZLES. 70-page illustrated catalog describes features, gives technical information on a line of injection machine nozzles. Specifications, prices. Injection Molders Supply Co. (F-023)

Fill out and mail this card now

MODERN PLASTICS MANUFACTURERS' LITERATURE SERVICE

Please send me the free items circled below. I am a non-subscriber*

I am a subscriber

F-001 F-002 F-003 F-004 F-005 F-006 F-007 F-008 F-009 F-010 F-011
F-012 F-013 F-014 F-015 F-016 F-017 F-018 F-019 F-020 F-021 F-022
F-023 F-024 F-025 F-026 F-027 F-028 F-029 F-030 F-031 F-032 F-033
F-034 F-035 F-036 F-037 F-038 F-039 F-040 F-041 F-042 F-043 F-044

Please
Print
Plainly

*If you do not have a personal subscription and would like to receive the next twelve monthly issues plus the next annual Encyclopedia issue U.S.A. & Canada, \$7.00; all others, \$25.00 please check below.

Check enclosed Send bill

NAME POSITION (Please Print Plainly)

COMPANY

STREET CITY STATE

(This card cannot be honored after Sept. 15, 1960)

FREE HELPFUL LITERATURE

There is valuable data—worth dollars and cents to you—in the literature and samples described below.

- ① SELECT the items you want
- ② CIRCLE the corresponding numbers on the post card
- ③ FILL IN the information requested
- ④ MAIL—no postage required

EQUIPMENT • SUPPLIES • SERVICES

PRE-COMPRESSED MOLDING. Illustrated 16-page brochure describes the pre-compressed molding method, with diagrammatic drawings, gives case histories and discusses its advantages, which include improved physical properties and quality of product and reduced finishing costs. W. R. Grace & Co. (F-024)

DEAERATION, DEGREASING, DEFOAMING EQUIPMENT. 19-page illustrated folder describes equipment designed to remove all air or gas from food products, pharmaceuticals, cosmetic creams, toothpaste, plastics, other liquid or semi-liquid products during manufacture. Specifications. Cornell Machine Co. (F-025)

CUSTOM PERFORATIONS. 6-page illustrated folder with sample, describes features and applications of custom perforations for artificial leather, foam rubber, plastics, paper, fabrics, coated fabrics, foil, felt, etc. Perforated Specialties Co., Inc. (F-026)

PLASTIC MATERIALS. 12-page illustrated brochure describes features and applications of a range of such plastics as polyethylene, phenolics, polystyrene, epoxy. Properties, specifications. Union Carbide Plastic Co. (F-027)

HYDRAULIC MACHINERY. 20-page book describes complete line of hydraulic equipment, special precision machinery for specific production requirements in plastics molding, extrusion, etc. Watson-Stillman Press Div., Farrell-Birmingham Co., Inc. (F-028)

POLYVINYL CHLORIDE COMPOUNDS. 8-page illustrated catalog folder describes features, composition, properties and applications of rigid un-

plasticized polyvinyl chloride compounds. Tables and specifications. B. F. Goodrich Chemical Co. (F-029)

SILICONE RUBBER. 12-page technical data catalog describes features, properties, and applications of room temperature vulcanizing silicone rubber compounds. Silicone Products Dept., General Electric. (F-030)

AC, DC DRYER MOTORS. Miscellaneous illustrated catalog material describes features and applications of a line of AC and DC power unit dryers and controllers. Reliance Electric & Engineering Co. (F-031)

HIGH-PRESSURE ACETYLENE DERIVATIVES. 8-page technical folder describes properties and applications of water soluble polymers, copolymers, monomers, solvents, etc., such as polyvinylpyrrolidone/vinyl acetate copolymers, butyrolactone, propargyl, etc. Antara Chemicals Div., General Aniline & Film Corp. (F-032)

METERING, MIXING, DISPENSING EQUIPMENT. 6-page folder describes features of equipment designed for metering, mixing, and dispensing, for use in the automotive industry, aircraft industry, marine construction, building construction, electronic fabrication. Pyles Industries, Inc. (F-033)

SUMMARY OF THERMOFORMING TECHNIQUES. 22-page illustrated brochure provides production information on machinery function, material characteristics and performance required of vacuum forming machines. Comet Industries. (F-034)

CARBON BLACKS FOR PAINT. 16-page booklet describes line of carbon black pigments designed for use in protective and decorative coatings. How-to-information on selection and applications. Godfrey L. Cabot, Inc. (F-035)

RECIRCULATING ELECTRIC UTILITY OVENS. 2-page brochure with photograph describes features of line of mechanical recirculating electric utility ovens designed for use by the electronic, paint, and chemical industry. Suitable for baking, drying, conditioning, preheating, and other utility jobs. Blue M Electric Co. (F-036)

PLASTIC SHEET SLITTING MACHINE. 4-page illustrated folder describes a machine designed for slitting rolls of plastic sheeting, film, similar materials to narrow rolls. Leedpak, Inc. (F-037)

GENERAL PURPOSE LAMINATOR. 2-page data sheet provides information, general specifications on machine designed for laminating and coating such materials as aluminum foil, light to heavy grades of paper, paperboard, plastic films. John Dusenberry Co., Inc. (F-038)

PLASTICS, SALES SERVICE. 14-page illustrated brochure describes features, facilities of sales service laboratory. Covers injection molding, extrusion, thermo-forming, other forming techniques, methods. Phillips Chemical Co. (F-039)

BLOW MOLDING MACHINE. 6-page illustrated brochure outlines features of a double unit blow molding machine. Units can be operated together or singly. Specifications, data, prices. The Newark Plastic Machinery Corp. (F-040)

INJECTION MACHINES. Illustrated 54-page catalog describes a line of injection machines with capacities up to 1½ ozs. Newbury Industries, Inc. (F-041)

ADHESIVE MELTER. Illustrated data sheet describes an electric melter for freeing adhesives from drums and storing the hot melt. Heats and stores 50 to 100 lbs. 150 to 450°. Sta-Warm Electric Co. (F-042)

PLASTICS INJECTION PRESS. Two-page illustrated catalog sheet gives information, technical data, specifications on automatic injection press with capacity for plasticizing material at rate of 22 lbs. per hr., molding pieces up to 2½ oz. Van Dorn Iron Works Co. (F-043)

COLORS AND PIGMENTS. 32-page catalog describes features, properties and applications of various color iron oxides. Tables, charts, specifications, prices and data. G. K. Williams & Co. (F-044)

Fill out and mail this card now



BUSINESS REPLY CARD

First Class Permit 2654, New York, N. Y.

MODERN PLASTICS

Village Station Box No. 103

NEW YORK 14, N. Y.

CONOCO *

H-35

your new extender of profit!

Another first in secondaries! CONOCO H-35 is the new extender of profit for cost-conscious producers of polyvinyl chloride resins. It's economical in price, consistent in quality and uniformity. CONOCO H-35 is water white and can be used in all types of applications where color is important. In plastisol and organosol formulations, significantly lower initial and aged viscosities can be obtained. Learn more about CONOCO H-35 and its uses. We'll be happy to supply you with free samples as well as technical assistance.

Send for your free booklet of facts and information about new CONOCO H-35... today!



For chemicals with a head start on the future, count on Conoco!



CONTINENTAL OIL COMPANY, PETROCHEMICAL DEPARTMENT
1270 Avenue of the Americas, N. Y. 20, N. Y. Export Division, Englewood,
New Jersey. European Sales Office: Box 1207, Rotterdam, The Netherlands.

© 1960, Continental Oil Company

staflex

plasticizers and stabilizers

STAFLEx® KA

We point with pride
to our many fine
Phthalate
Adipate
Azelate
Sebacate
and
Ricinoleate
Plasticizers

May we explain their
advantages to you —
to help you to a
better product.

Time-proven stabilizers
are readily available
for sampling.

Why not inquire today?

DeeCo
PRODUCTS CO.

Plasticizers
and Stabilizers
120 POTTER STREET
CAMBRIDGE 42, MASS.

Polyester-steel

(From p. 109)

reportedly shown 10 times more abrasion resistance than materials presently used for counter tops. It is also said to be unaffected by most acids and other chemicals, oxygen, and industrial fumes. Service temperatures are in the range from -40 to over 200° F. The strip is presently produced in widths up to 48 inches. National Steel looks toward a volume of 1500 running ft./min. (of various widths), three 8-hr. shifts per day.

How the coil is produced

After the steel coil has been thoroughly cleaned, it goes through a composite two-unit oven at a curing temperature of 300 to 600° F. Prior to this "curing," two applicators have deposited preheated plastic coatings to both sides of the metal. A proprietary adhesive is applied on the decorative side, while the reverse side gets a protective or decorative coating, depending on customer specifications.

As the coil comes from the dual oven, the protective coating on the reverse side has been cured. The adhesive-type coating on the decorative side is "tacky" in preparation for the application of a polyester decorative film. This film is fed from immediately below the dual oven to pressure rolls.

The decorative film, supplied by Di-Noc Chemical Arts Inc., is a non-oriented polyester formulation based on a Goodyear resin tradenamed Vitel, and is of the same family as Goodyear's extruded Videne film. To produce the film, Di-Noc casts the resin on a dry-strip backing paper.

As soon as the continuous coil leaves the pressure roller which has applied the film, it passes into the cooling section. Here, the metal, from a temperature of about 350° F. or higher, is "shocked" to a temperature just below freezing to produce the right degree of bond and set.

The development is still in its infancy and meaningful volume figures are not available. National Steel, however, reports lively end user interest and anticipates sizable volumes to be consumed by many industries.—End

R E S E A R C H & D E V E L O P M E N T

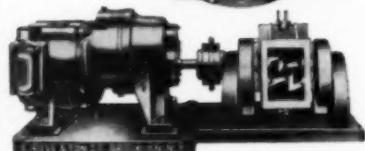
REQUIRES THE BEST
MIXING, GRINDING
& DISPERSING EQUIPMENT



#130EL—2 gal.
variable speed
Double Planetary
Change
Can Mixer—1
qt.—150 gal.
sizes.



#130EL—1 gal.
vacuum tight Mixer.
Available with
stainless steel
seamless jacketed
cans and up to 1
HP exp. prf. motor
drive.



#41A-1 Pt. Double Arm Kneader. Easy to
clean, jacketed, and with vacuum cover when
required. 1 Pt.—150 gal. sizes.



#52LC—4 1/2" x 10".
Three Roll Mill
with water cooled
rolls, one point ad-
justment and quick
roll release. 2 1/2"
x 5" — 16" x 40"
sizes.



#70-H size 4 Dry
Grinding Mill Vari-
able speed drive,
with 1" feed size
ground between 1/8"
and #100 mesh as
required. Many sizes
including other type
Disintegrators, Crush-
ers and Pulverizers.



#140DL—High
Speed Disperser
with specially de-
signed multiple
action Millhead.
Variable speeds
up to 8000 FPM
produce tremen-
dous impact,
abrasion and hy-
draulic shear.
Laboratory or
production sizes.

Write for complete information!

CHAS. ROSS & SON CO., INC.

Leading mfrs. of wet or dry grinding Mills,
Kneaders and Mixers of all types — since 1869.

Classon Ave., Brooklyn, N. Y.

Ross

10 BRIGHT COLORS

for industrial finishes...plastics

exceptionally heat stable—excellent permanence—exceedingly easy to disperse

CADMIUM RED PIGMENTS

Cadmium Lithopones

Orange Red No. 70

Light Red No. 80

Medium Light Red No. 90

Medium Red No. 100

Dark Red No. 110

Maroon No. 120

BLEED PROOF



CADMIUM YELLOW PIGMENTS

Cadmium Lithopones

Primrose No. 20

Lemon No. 30

Golden No. 40

Orange No. 50

BLEED PROOF



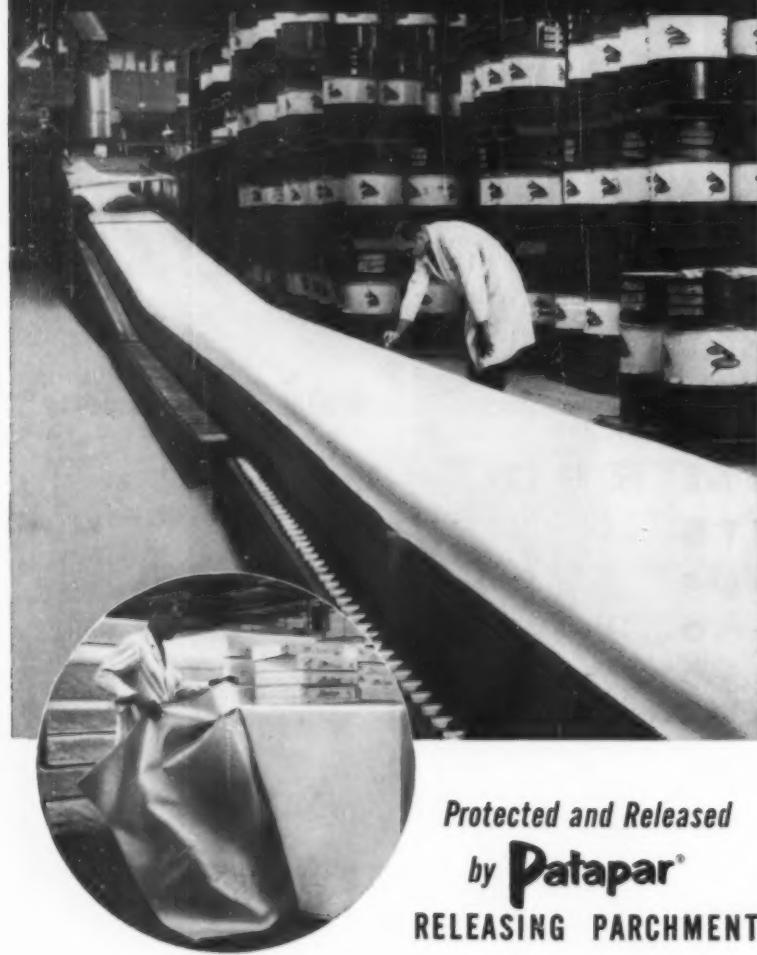
SAMPLES AND COLOR FOLDER showing full range of Yellows and Reds, CP and Lithopone, will be gladly furnished on request

THE HARSHAW CHEMICAL CO.
CLEVELAND 6, OHIO

Chicago • Cincinnati • Cleveland • Detroit • Houston • Los Angeles • Newark • Philadelphia • Pittsburgh



Miles and miles of foam...



Protected and Released by Patapar® RELEASING PARCHMENT

quickly, easily . . . without marring or pitting the foam surface.

Additional advantages are derived from Patapar's high strength, dense, fiber-free surface, and its ability to withstand the exothermic reaction which takes place in the foam.

Perhaps Patapar Releasing Parchment can be an aid in your process. Send for free sample and information package.



"Something Special in Papers"



PATERSON PARCHMENT PAPER CO.

BRISTOL, PENNSYLVANIA

Sales Offices: New York, Chicago • West Coast Plant: Sunnyvale, Cal.

High-clarity blown film

(From pp. 115-118)

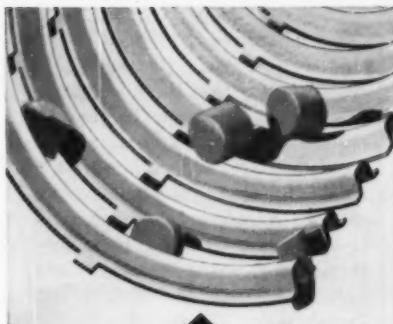
made while operating only with a high (20 in.) frost line (See Table V, p. 118). The high frost line did improve optical properties, but to a much lesser degree than the annealing chamber. In the case of Petrothene 201, transmittance was increased from 39 to 52% by raising the frost line 12 inches. Adding an 8-in. annealing chamber and using a 1-sec. retention time increased transmittance to 70 percent. Other optical properties were similarly improved, with little or no change in physical properties of the film. Extrusion conditions and melt temperatures were identical for all trial runs.

Since the polymer is in the melt stage for a considerably longer length of time when the annealing chamber is used, control of the haul-off variables must be stringent in order to minimize wrinkles. Alignment of the die, nip rolls and forming canopy is critical, as is gage control.

The air ring should be constructed so that the cooling air impinges against the film surface at approximately a 30° angle. There should be sufficient clearance between the bubble and the air ring orifice so the force of the air impinging against the bubble does not cause the bubble to vibrate. As is the case without a chamber, the film must be sufficiently cooled before it passes through the nip rolls. Otherwise, the film may be damaged and its properties adversely affected.

In the studies reported here, blocking was observed to be significantly increased when using the annealing chamber, due to the reduction in cooling time available. For the equipment used, the distance between the die face and nip rolls was 7.5 feet. Using the chamber raised the frost line and decreased the cooling distance to only 4 to 5 ft. between the nip rolls and the air ring orifice. By increasing the slip concentration, blocking was almost eliminated. Therefore, it is felt blocking can be completely eliminated with the use of a higher take-off canopy and, if necessary, the use of anti-block agents and higher slip formulations.—End

get accurate sizing with SIMON-CARTER machines

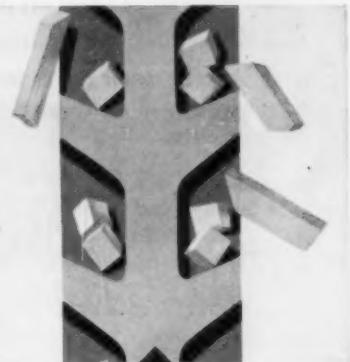


PRECISION GRADERS SEPARATE MATERIAL BY THICKNESS

For sizing and separating free-flowing granular materials by thickness, Carter Precision Graders use revolving cylinders with slotted perforations. Material placed in these cylinders is upended and presented to the slots in an edgewise position. The thinner pieces pass through, and the thicker pieces pass over and are conveyed to the end of the machine.

CARTER GRADERS ALSO SIZE AND SEPARATE BY WIDTH

For width sizing and separating, the Precision Graders use revolving cylinders with round perforations. Material placed in these cylinders is upended and presented to the round perforations in an endwise position. Narrow pieces pass through, and wider pieces pass over for discharge at the end of the cylinder.



CARTER SEPARATORS ASSURE POSITIVE LENGTH SEPARATION

Carter Disc Separators contain a series of discs, each of which has hundreds of undercut pockets which select or reject materials according to length. As the discs revolve through a mixture of materials, the pockets lift out shorter pieces. Longer pieces, too long to be held in the pockets as they rise, drop away from the discs.

Write today for complete information and descriptive booklets on Simon-Carter machines. Free laboratory testing and demonstrating service.



SIMON-CARTER CO.

659 19TH AVENUE N.E. MINNEAPOLIS 18, MINNESOTA

Design tips

(From pp. 130-135)

is best to select an edge geometry that will provide the maximum rigidity comparable with esthetics and function. This phase of design is important where the edge is straight or where it must "mate" with another component; for example, a rectangular box and lid. Figure 9, p. 135, illustrates lip design features that can be employed to increase the rigidity of this section. Figure 10, p. 135, is a photograph showing items with these designs. The part at the extreme right of the photograph uses the same turned lip design of the center bowls in reverse.

General design

In addition to features that are desirable from the standpoints of rigidity and freedom from distortion, there are several other important aspects of polyolefin item design. As with other materials, extreme or abrupt variations in wall thickness and sharp corners that might serve as points for stress

concentration should be avoided if at all possible.

Gussets and ribs should usually be no greater than 50 to 80% of adjoining wall sections and, where possible, should be avoided altogether. Excessively heavy ribs can cause objectionable sink marks and distortion of adjoining walls, thereby spoiling the appearance of the part.

Of particular importance in designing polyolefin items is the gate area. This section should be thick enough to allow rapid filling and minimize orientation. It is usually advisable to make the gate section of large items up to 25% thicker than other areas. This improves the ease of fill, prevents excessive cooling of resin flowing to extremities and results in improved impact strength. The thickness at this point can, of course, be carried to the extreme causing jetting and excessive shrinkage, which may take place under such conditions.

Where possible, it is desirable to gate into a dome or other expansion feature of the types illustrated in Fig. 11, p. 135, thereby per-

mitting some relief of molded-in stress which occurs here.

The importance of the surface appearance of molded consumer items cannot be over emphasized. With most grades of polyolefin resins it is possible to accurately reproduce the mold surface. A high gloss or attractive "three dimensional" texture can be readily achieved. However, the luxurious appearance and excellent mar resistance imparted by use of a "pebble-grain" or other "three dimensional" surface texture is just beginning to be realized. This type of surface virtually eliminates the possibility of "flow marks," weld lines, and other undesirable surface imperfections.

As shown in the figures and verified by the experience of many molders, an item that might otherwise be difficult to produce from polyolefins can often be greatly improved and made easier to produce with high quality by using proper part design principles. Proper design may also reduce costs by eliminating rejects.—End

When the problem is
Inorganic pigments and
extenders for compounding
plastics...

WILLIAMS invites you to
take advantage of its **80 YEARS**
EXPERIENCE

Today Williams offers a complete line of inorganic pigments and extenders for the plastics industry. All have color permanence and chemical stability. Here is a representative list of these products.

Pure Red Iron Oxides • Pure Yellow Iron Oxides • Pure Black Iron Oxides • Pure Brown Iron Oxides • Pure Chromium Oxide Greens
Pure Hydrated Chromium Oxides • Umbers • Siennas • Lampblack
Anhydrous Calcium Sulfate • Barytes • Calcium Carbonates

Send today for detailed Technical Reports which give you complete description of the chemical and physical properties of each product listed above. Address Department 75, C. K. Williams & Co., 640 N. 13th Street, Easton, Pennsylvania.

WILLIAMS
COLORS & PIGMENTS

C. K. WILLIAMS & CO. • E. ST. LOUIS, ILL. • EASTON, PA. • EMERYVILLE, CAL.

Process Film **Faster for Less...**

with the **LIBERTY**
COMPENSATOR

Read How—and Why
the Compensator Cuts
Delay at Take-Off!

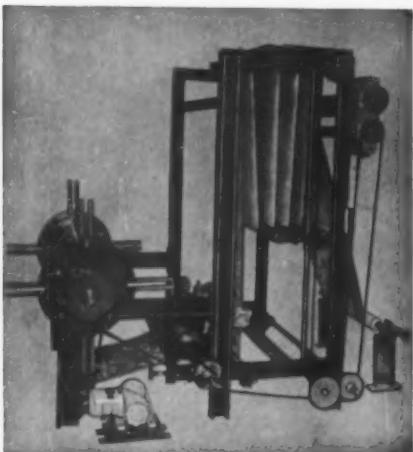
Turret rewind facilitates rapid
roll changes.

70 feet of material with which
to work.

Turret can be used on back of
any web-processing machine.

Precision guides insure straight
rewinds.

Smooth-running assembly eliminates
wrinkles.



For further details of Liberty's complete range of economical, easy-to-operate processing equipment—including polishing units, embossers, one and two-color presses and inspection units—write for Liberty's free catalog!



LIBERTY
MACHINE CO. INC.

275 FOURTH AVENUE, PATERSON 4, N. J.

RP structures

(From pp. 120-128)

is incorrect since the resin has a finite modulus of rigidity.

Many physical properties of fibrous glass must be investigated in order to determine their effect on the strength of a laminate. The effect of resin content, resin shear and tensile strengths, resin shrinkage, and surface finish need be evaluated. Work has been performed by the Forest Products Laboratory and the Wright Air Development Center, U. S. Air Force, to determine the effect of material variables on the strength of such laminates. However, additional basic studies as well as design correlation of the results are required (2).

Tests to determine basic material properties should be re-evaluated with particular reference to specimen thickness. Some experimental data obtained from tension and compression tests have been published (11) but more recent tension tests at Grumman Aircraft Engineering Corp. indicate a need for additional testing and evaluation.

Experimental data: The majority of existing experimental data is from tests performed by the Forest Products Laboratory (2-8). Figure 6, p. 127, shows the results of tension tests performed on two of the following widely used glass fabrics, each supported by a high-temperature-setting, low-viscosity polyester resin (6). Type 181 fabric is approximately crossplied, and Type 143 fabric has a 9:1 ratio of warp-to-fill strength. Also shown in Fig. 6 are the computed values of tensile strength based on the theory. Agreement between tests and theory is very good, as illustrated in the plots that are shown in Fig. 6.

Tension tests were performed on two different laminates composed of the above fabrics and resin (3). The panel in Test 1 consisted of 13 layers of Type 143 fabric; 9 layers were oriented with their warp direction parallel to the axis of reference, 2 layers were oriented 40° from the axis of reference, and 2 layers were oriented 70° from the axis of reference. For the panel in Test 2, three layers of Type 162 fabric

were oriented with their warp direction parallel to the axis of reference, four layers of Type 143 fabric were oriented 170° from the axis of reference, and five layers of Type 181 fabric were oriented 40° from the axis of reference. The panels were loaded in tension at various angles to the axis of reference. The experimental and theoretical results are shown in Fig. 7, p. 128; agreement is unusually good.

The system in use

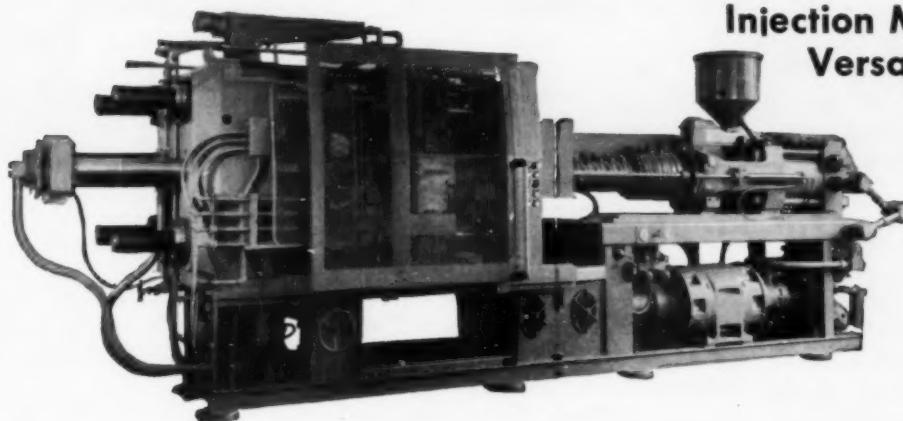
The mathematical procedure presented in this paper has been programmed for the IBM 704 computer at Grumman. A program has been initiated to obtain design curves for predicting optimum layer orientation in a laminate subjected to axial and shear loads in the plane of the laminate. Several widely used types of glass fabric are being tested in order to obtain basic material properties. Future work will include the testing of single fabric and multiple fabric laminates together with various layer

orientations and a comparison with the theory.

The theory is being extended to include filament wound cylindrical structures, and optimum winding patterns are being investigated. A test program is in progress at the present time.

References

1. A. E. H. Love, "The Mathematical Theory of Elasticity." Chapters 1 and 6.
2. ANC-17. Plastics for Aircraft, June 1955.
3. E. C. O. Erickson and C. B. Norris, "Tensile Properties of Glass-Fabric Laminates with Laminations Oriented in Any Way," Forest Products Laboratory. FPL Report No. 1853. November 1955.
4. C. B. Norris, "Strength of Orthotropic Materials Subjected to Combined Stresses," Forest Products Laboratory. FPL No. 1816. July 1950.
5. F. Werren and C. B. Norris, "Mechanical Properties of a Laminate Designed to be Isotropic," Forest Products Laboratory. FPL Report No. 1841. May 1953.
6. A. D. Freas and F. Werren, "Directional Properties of Glass-Fabric-Base Plastic Lamine Panels of Sizes that Do Not Buckle," Forest Products Laboratory. FPL Nos. 1803, 1803-A, and 1803-B. 1955-1956.
7. F. Werren, "Mechanical Properties of Plastic Laminates," Forest Products Laboratory. FPL Nos. 1820, 1820-A, 1820-B, 1820-C, and 1820-D. 1951-1958.
8. A. D. Freas and F. Werren, "Mechanical Properties of Cross-Laminated and Composite Glass-Fabric-Base Laminates," Forest Products Laboratory. FPL Nos. 1821 and 1821-A. 1953.
9. A. G. H. Dietz, "Engineering Laminates." John Wiley and Sons Inc. 1949.
10. A. G. H. Dietz, "Stresses in Reinforced Laminates." IAS Preprints; Reinforced Plastics in Airplanes. May 19, 1953.
11. K. H. Boller, "Effect of Thickness on Strength of Glass-Fabric-Base Plastic Laminates." FPL No. 1831. May 1954.—End



Injection Molding's Most Versatile Performer!



Announcing the new 20 ounce Impco

Model HA16-425

200 Pounds Per Hour Plasticizing Capacity

24½ Inch Stroke

720 Dry Cycles Per Hour

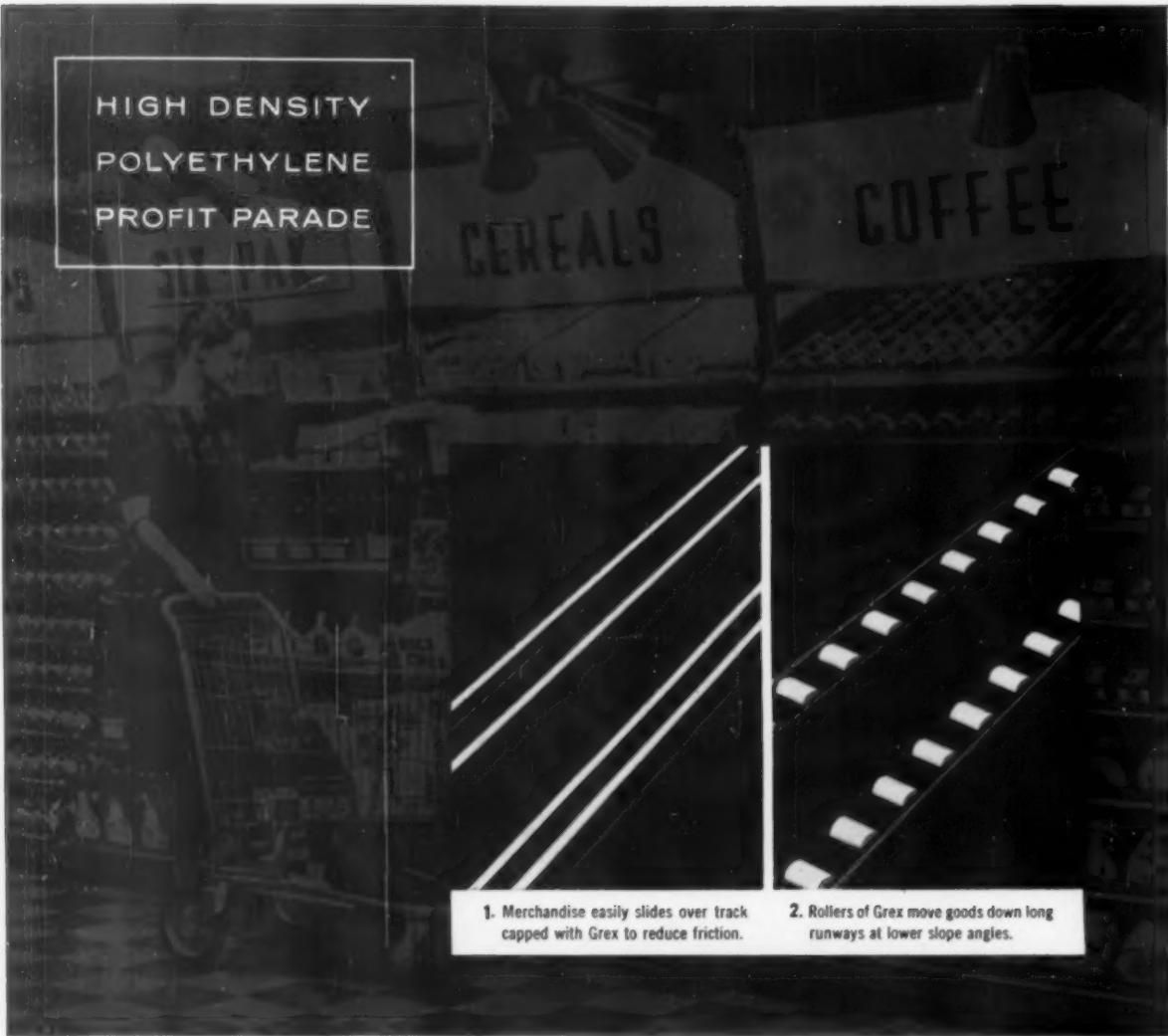
Hydraulic Knockout

IMPROVED MACHINERY INC. NASHUA, NEW HAMPSHIRE

In Canada, Sherbrooke Machineries Ltd., Sherbrooke, Quebec

Export Distributors: Omni Products Corp., 460 Fourth Avenue, New York, New York

HIGH DENSITY
POLYETHYLENE
PROFIT PARADE



1. Merchandise easily slides over track capped with Grex to reduce friction.

2. Rollers of Grex move goods down long runways at lower slope angles.

Grace Plastic Solves Friction Problem 2 Ways

North American Equipment Company finds that Grex high density polyethylene is the most practical material available for reducing friction in two types of gravity storage installations. These are utilized in both "Food-O-Mat" for supermarket merchandising and "Quik-Pik" for industrial order picking.

"Quik-Pik" units hold stock which automatically slides down a runway as items are picked from the front. The problem is friction. This friction is overcome in one type of installation by using runways capped with an extruded Grex tubing made by Action Plastics, Inc. Stock slides smoothly over Grex at a slope angle of 12°-14°. The other type of installation moves merchandise at an even lower

angle (4°-6°) by utilizing tracks with Grex rollers that never require lubrication and never freeze up. Rollers are made by Gar-Mold, Sefton Div. of Container Corp. of America.

The manufacturer of "Quik-Pik" and "Food-O-Mat" is building a profitable business with superior products that exploit the remarkable properties of Grex. Perhaps you can do the same.

The best way to find out is by calling in the high density polyethylene experts. Grace has the production facilities, technical service and experience to help put your product in the Grex profit parade. Everyone says we're easy to do business with.

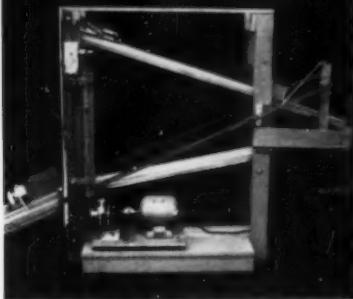
Grex is the trademark for W. R. Grace & Co.'s Polyolefins.

W.R. GRACE & CO.
POLYMER CHEMICALS DIVISION



CLIFTON, NEW JERSEY

GRACE TECHNICAL CORNER



How to find out for certain if Grex is suitable for your product.

The rather odd-looking device shown here is a "sliding" machine, invented in the Grace Physical Testing Laboratory. Its purpose was to test the performance of Grex capping for use on metal tracks in "Quik-Pik" installations. Since the tests were highly successful (the manufacturer uses Grex capping at the rate of 2,000,000 feet per year) the machine itself now serves only one function. It testifies that you can expect the same individual help in determining how Grex will work for your product.

Simulates use conditions. Although the Grace laboratories are equipped with every standard physical testing device, it is often difficult to simulate conditions of product usage without devising special equipment. The "sliding" machine is one example of such a device. It was developed to measure abrasion resistance of Grex capping under simulated use conditions. A container is placed at the top of the machine, slides through two tracks and is automatically lifted to the top again for a new cycle. In this way it was possible to simulate two years of usage within a short period of time and determine that the capping would provide satisfactory performance.

Other examples. Ingenious is the word to describe other devices specially built to test performance of Grex applications. A mechanical foot was invented to simulate the operation of a step-on garbage can. By running the can through some five thousand cycles, weaknesses were spotted and corrected to make a satisfactory product. Similarly, a method was devised for testing a series of pulleys under identical conditions to determine the most suitable design and resin grade.

Do you want help? Physical testing is only one of several facets of Grace technical service at your command. If you have an application for high density polyethylene—or think you have—now's the time to contact:

Technical Service Department
W. R. Grace & Co., Clifton, N.J.

Permeability

(From pp. 139-145)

described in a previous paper (3). A constant pressure of vapor was maintained over the film by using a supply of degassed liquid water or methanol at the appropriate temperature. The vapor pressure was measured with a Zimmerli gage. Figure 1, p. 139, shows the effect of temperature on the water vapor permeability of the homopolymer, plasticized homopolymer, and the Kel-F 500 copolymer. It can be seen that after keeping the latter at a high temperature, there was a marked drop in the permeability constant, which was presumably due to further crystallization.

Furthermore, there is an inflection in the Arrhenius plots, similar to those found with other polymers (3, 6), when passing through the glass temperature and the inflection point can be similarly interpreted. This would lead to a glass temperature of about 75° C. for the "amorphous" homopolymer. Attempts were made to determine the glass temperature with other gases.

Figure 2, p. 145, demonstrates a similar plot with carbon dioxide. Here there is only a slight inflection, indicating a glass temperature of about 50° C. This is closer to the value of 52° C. found by Hoffman and Weeks using the specific volume method (10). The higher values found with water vapor could be due to the larger size of diffusing species; this could indicate the movement of water vapor through the hydrophobic film in the form of clusters, as suggested by Rouse (11).

The Kel-F 500 films are internally plasticized by a small degree of copolymerization and the Kel-F 300P25 films are plasticized externally by the addition of low molecular weight Kel-F as plasticizer. Both of these treatments, as would be anticipated from the gas data, lead to a marked increase in the water vapor permeability constants.

Data for the methanol permeabilities of Kel-F 300 homopolymer and Kel-F 500 copolymer are given in Fig. 3, p. 145. The phenomenon of irreversible lowering of the permeability at higher tem-

peratures is again shown and is presumably due to further crystallization of the polymer as it is "annealed" during the measurements at higher temperature.

The methanol permeabilities are much higher for the "amorphous" homopolymer than for the Kel-F 500 copolymer. This may be due to the low crystallinity leading to a greater solubility in the former case. With organic polymers solubility plays a much more important role than with the gases in determining the size of the permeability constant.

Typical permeability values for polychlorofluoroethylene films and other polymer films to the common gases and to water vapor are given in Table VII, p. 145. It can be seen from these data that Kel-F films provide exceptional gas and water vapor resistance.

We would like to thank the M. W. Kellogg Co. for sponsoring this study and providing the samples of the various films and the data concerning them. The Kel-F Div. of the company has since been absorbed by the Minnesota Mining & Mfg. Co.

References

1. R. M. Barrer and G. Skirrow, *J. Polymer Sci.* 3, 549 (1948).
2. W. Heilman, V. Tammela, J. A. Meyer, V. Stannett, and M. Szwarc, *Ind. Eng. Chem.* 48, 821 (1956).
3. C. E. Rogers, J. A. Meyer, V. Stannett, and M. Szwarc, *TAPPI* 39, 741 (1956).
4. A. W. Myers, C. E. Rogers, V. Stannett, and M. Szwarc, *Modern Plastics* 34, 157 (May 1957).
5. C. E. Rogers, A. W. Myers, V. Stannett, and M. Szwarc, *Plastics Progress* (London), III, 45, 1958; *TAPPI* 41, 716 (1958).
6. P. Meares, *J. Am. Chem. Soc.* 76, 3415 (1954).
7. D. W. Brubaker and K. Kammermeyer, *Ind. Eng. Chem.* 45, 1148 (1953).
8. R. Waack, N. H. Alex, H. L. Frisch, V. Stannett, and M. Szwarc, *Ind. Eng. Chem.* 47, 2524 (1955).
9. I. Sobolev, J. A. Meyer, V. Stannett, and M. Szwarc, *Ind. Eng. Chem.* 49, 441 (1957).
10. J. D. Hoffman and J. J. Weeks, *J. Polym. Sci.* 28, 472 (1958).
11. P. E. Rouse, *J. Am. Chem. Soc.* 69, 1068 (1947).—End

**IMS MIDGET
INJECTION MOLD CIRCULATOR
DOES
GIANT JOBS
AT
LOW COST!**

- ★ Lowest maintenance
- ★ Quick positive heat
- ★ New more compact design
- ★ Only 15" x 22 1/2" floor space

**CLOSED CIRCUIT
CUTS WATER BILLS !**



The IMS Midget Low Cost Circulator does the same job as big units at one third the cost. Holds injection mold temperatures at a constant $\pm 2^\circ$ at any setting from 50 to 210°. New large thermometer dial permits rapid check of heat. Use closed circuit heating with anti-rust to maintain your molds at top efficiency! Available for 220 volt, 60 cycle, 1 phase only.

IMMEDIATE SHIPMENT FROM STOCK

Price \$391.50

INJECTION MOLDERS SUPPLY CO.

3514 LEE ROAD

WYOMING 1-1424

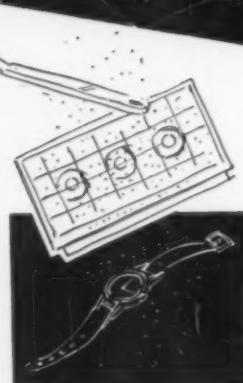
CLEVELAND 20, OHIO



P + F = S

The "P" is for plastic, the "F" for fragrance, and the "S" for sales. It's a simple formula and the only wonder is why more plastic manufacturers and fabricators have not used it to their own advantage. Fragrance specialties for plastics are low in cost and very effective. They may be used in two ways—either to modify or mask any unpleasant odor the plastic may possess, or to give the finished plastic product an appealing and appropriate scent. We'll be glad to discuss either possibility with you if you're interested. Meanwhile, write us now for timely pamphlet on this subject:

"PLASTIC ODORANTS BY FRITZSCHE" . . . it's FREE!



**FRITZSCHE
BROTHERS, INC.**

PORT AUTHORITY BUILDING
76 Ninth Avenue, New York 11, N.Y.
(BRANCH OFFICES IN PRINCIPAL CITIES)



EST. 1871

Determination

(From pp. 156-160)

Eq. 7. Four sets of experimental results appear in Fig. 1, p. 156.

A preferred method of solution, when sufficient points are available, is to fit the experimental data to a straight line by means of the statistical least-square approach. A step-by-step solution has been worked out for local use by a laboratory assistant. Confidence limits on the fit are obtained and are interpreted as a measure of variations in cell structure within the specimen.

Evaluation of method

The method described has been in regular use as a tool in studies of formulation and processing variables for about one year. Results have been valuable in understanding some effects of structure on the properties of rigid polyether urethane foams.

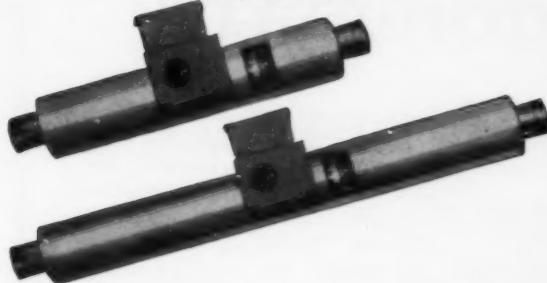
It has been established that the 90% confidence limits on V_g , for the apparatus and techniques described, are as low as 10^{-3} cc. This is taken as the basic level of experimental error; larger limits represent nonuniformity of cell size within the specimen.

When attempts were made to estimate the accuracy of the displacement method by comparison with microscopic studies (Table I, p. 158) reasonable agreement was obtained. It was, in fact, concluded from this experience that the displacement method is the better of the two because of the difficulty in 1) converting linear microscopic dimensions of the polyhedral cells to volumes, 2) obtaining accurate dimensions of cells inclined from the plane of microscopic focus, and 3) studying representatively large samples under the microscope. The displacement approach is obviously more economical and more adaptable to routine usage.

The desirability of the present method for determinations of open cell content is illustrated in Table II, p. 158. It is clear that individual R & P results are sensitive to specimen dimensions and should always be reported at some standard R, agreed on by all interested parties. This difficulty is solved automatically when F is

Sta-Warm ELECTRICALLY HEATED PIPE AND TUBING

Unit Lengths from 1 to 20 feet
Any Diameter



DESIGNED FOR QUICK, EFFICIENT TRANSFER OF HEATED PLASTICS, ASPHALT, WAXES, PARAFFIN, RESINS, ADHESIVES, POTTING COMPOUNDS OR LOW MELTING POINT SOFT METALS WITHOUT HEAT LOSS.

Sta-Warm engineers and builds a complete line of rigid pipe and tubing for use with heated melting or pressure tanks. Black or stainless steel, brass, bronze, copper, aluminum, nickel and Monel available.

WANT A CATALOG? WRITE TODAY.



Sta-Warm
ELECTRIC CO.
858 N. CHESTNUT ST., RAVENNA, OHIO
Subsidiary of ABRASIVE & METAL PRODUCTS CO.

reported. It may also be pointed out that, when Eq. 7 has been solved for a foam, the effective open cell content of that material may be estimated for any application involving exposed surfaces.

Application of results

It is probably true that the main reason for the lack of quantitative information concerning the effects of cell structure on foam properties is the need for a convenient means of describing this variable accurately. That such a technique is useful may be illustrated by a few general examples taken from the experience of this laboratory.

In one case a rigid polyether urethane foam was prepared in adjustable molds with opposite walls spaced to provide 2 to 8 in. of foam thickness in 1 in. increments. Reactants were foamed through a machine at each of two rotor speeds. At mixing speed A, V_g was 0.0002 cc., while at speed B, V_g was 0.0011 cc., regardless of mold dimensions. The volume fraction of open cells was constant at 0.02 for all molds and

both mixer speeds. All foamed products developed identical mechanical properties.

A second series of polyether foams was employed in an inquiry into cell nucleation. The presence of air in a foam is known to reduce cell size, and theoretically a dispersed crystalline solid should do the same. With no air a certain product developed a coarse, open structure; V_g was 0.0150 cc. and F was 0.13. When 5 to 25 vol.-% of air was whipped into the liquid reactants, V_g and F were reduced to 0.0015 and 0.015, respectively. Mechanical properties and density of the latter products averaged the same as the former, but showed improved reproducibility. Dimensional stability of the open-celled product was nearly perfect, whereas the fine-celled material swelled during extended exposure to 100% relative humidity at 70° C.

When 1 volume % of a crystalline solid was added to the same liquid foam ingredients, with no air, V_g and F were found to be 0.0040 cc. and 0.025. When air and

SOLVE YOUR PACKING PROBLEMS

at Low Cost with

PARTITIONS

• Sleeves • Necks •
FOR PROTECTIVE
PACKAGING



WHITE, PHONE, WIRE for QUOTATIONS on YOUR REQUIREMENTS

Peter Partition Corp. operates one of America's largest plants devoted exclusively to the production of cardboard partitions.

PETER PARTITION CORP.

Manufacturers of Cardboard Partitions

124 BOERUM PLACE

BROOKLYN 1, N.Y.

Telephone: TRIangle 5-4033

the solid were used jointly, V_g and F were about 0.0007 cc. and 0.000, respectively. In spite of these latter changes in structure, mechanical properties continued reproducible and unchanged; dimensional stability improved in the presence of the solid.

A number of additional examples could be presented showing effects of cell structure on the heat and mass transfer characteristics of foams. With sufficient information of this type, it becomes possible to distinguish between effects caused by the organic and by the surface chemistry of a foam system. It is then practical to achieve desired properties by deliberate control of structure.

Acknowledgments

The assistance of R. L. Rollins in performing calculations, and of E. L. Buster and J. H. Parsons in operating the local apparatus and improving techniques is appreciated. The assistance of personnel of Union Carbide Chemicals Co. in preparing this data for publication is gratefully received.—End

THE PLASTISCOPE*

News and interpretations of the news

By R. L. Van Boskirk

Section 2 (Section 1 starts on p. 41)

June 1960

New high-impact styrene

Development of two new high-impact polystyrene resins with improved toughness characteristics has been announced by The Dow Chemical Co. They are designated Styron 475B and 475C.

Styron 475B is an extrusion resin for making sheet used in thermoforming; 475C is a molding grade designed for use in most molding applications, especially thin section parts or those where long flow areas are encountered. Applications for the new materials include refrigerator door liners, formed cheese containers, and small appliance parts. The two new resins are priced the same as Styron 475 at 28½¢/lb. For special colors, the price is 32½¢ per pound.

PVC film for records

A new high-strength grade of unplasticized vinyl film and sheeting possessing properties especially suitable for the manufacture of low-cost advertising and educational phonograph records has been announced by Monsanto Chemical Co.'s Plastics Div. Trademarked Ultron R-501, it is available in thicknesses from 0.004 to 0.020 inch. The thin pliable vinyl permits the record to be stapled or stitched in magazines and books without special equipment, the company states. For mailings, the unbreakable records can be sent flat or can be easily rolled up for cylindrical tubes. Reported to have high fidelity, the records can be replayed hundreds of times and can be made from several colors of Ultron material in transcription speeds ranging from 33 to 78 r.p.m. For other uses such as wall coverings, flooring, maps, displays, luggage, lamp shades, and vinyl metal laminates, the new material can be vacuum formed at normal temperatures, and can be

printed on lithograph, letterpress, and rotogravure equipment with excellent results, Monsanto states.

Now polypropylene film bids for cellophane markets

The overwrapping market, now dominated by cellophane, is the main target of Kordite 1500, a heat-sealable biaxially oriented polypropylene packaging film developed by The Kordite Co., Div. of National Distillers & Chemical Corp., Macedon, N. Y. Unlike other thermoplastic films, the new material is claimed to operate well on most existing automatic packaging machines and the company claims that Kordite 1500 can be used for overwrapping textiles, cigarettes, chewing gum, candy, and consumer products requiring moisture protection.

According to Kordite, ½-mil thickness of the new film provides the same protection as 1-mil thick cellophane, and since Kordite 1500 has two-thirds the density of cellophane, the PP film is said to be cheaper. Normal coverage of 1-mil cellophane is said to be about 20,000 sq. in./lb., compared with 50,000 sq. in./lb. of the new material. The introductory price of the new material in ½-mil thickness is 3½¢ per 1000 sq. in., and the company claims that the eventual price may go down to 1½¢ per 1000 sq. in. Basically, the new film is like cellophane in strength (20,000 to 40,000 p.s.i.), stiffness, clarity, grease-resistance, and handling properties; and like polyethylene in moisture properties, and dimensional stability irrespective of humidity changes, the company claims.

The improved properties of the new material are due to the biaxial orientation which, in the case of polypropylene, increases strength and stiffness by about four times. It also improves optical properties and eliminates low temperature brittleness associated

with unoriented polypropylene. However, Kordite points out that, although its film is biaxially oriented, its mechanical properties are not the same in both directions. Kordite 1500 has a special coating to improve its heat sealability. Oriented films can be heat sealed, but they disorient during the heat sealing process and may cause pucker or weak seals.

The coating also allows the seals to be peeled apart, thus facilitating opening of a package. Biaxially oriented film without the coating is also available for evaluation and is called Kordite 1000. This material is expected to find markets in produce packaging and for window envelopes.

PP fiber resists sun

Development of a polypropylene fiber that is said to resist the effects of sunlight has been announced by United States Rubber Co. The fiber, developed chiefly for outdoor furniture webbing, has been made part of the company's line of synthetic fibers and is known as Royalene UF.

Laboratory and Florida sun tests reportedly indicate excellent performance of the fiber for a period of more than four years. In addition, the fiber has greater initial tensile strength and can be made in brighter colors than other sun-resistant synthetic fibers now available, according to the company. The sun-resistant feature is attained by using a highly stabilized PP resin in conjunction with a special process developed by the company's research division.

PE for pipe

Polyethylene formulations which are said to yield pipe at fast production rates with smooth, glossy surfaces both inside and outside have been made available by Eastman Chemical Products Inc., subsidiary of East- (To page 216)

* Reg. U.S. Pat. Off.

NOW: The positive solution to stubborn release problems...

Precision-controlled Daubert Release Papers

Individualized to fit your specific needs

From whisk-away ease of release to a gentle or moderate "bite", the new Daubert papers can be *individualized* to provide the exact level of release-ability needed for easier handling, more efficient production or utilization of your products.

Equally important, precision-control of manufacture assures you of consistent, uniform quality and performance with Daubert papers . . . shipment after shipment.

A wide choice of base stocks—super calendered sulfites and krafts, parchmentized and clay-coated krafts, and foils—will provide just the right strength, weight, flexibility *and* finish you desire in a release sheet.

Requests for free technical assistance and samples invited.

Daubert release papers have proved outstanding in these applications: • Film casting • Foamed products • Rubber curing • Tapes • Pressure-sensitive labels, decals, decorative plastics, nameplates,wallpapers

DAUBERT CHEMICAL COMPANY

Our Twenty-Fifth Year

25

4700 S. Central Avenue, Chicago 38, Illinois • Telephone LUdlow 2-1000

DISTRIBUTORS IN PRINCIPAL CITIES

THE PLASTISCOPE

(From page 214)

man Kodak Co. The two new formulations are said to meet the requirements for Type II and Type III polyethylene pipe, respectively, as defined in the proposed revision of the commercial standard CS 197-59. According to the company, pipe extruded from both materials has passed the 1000-hr. sustained pressure tests at both 73° and 100° F., the incremental pressure test, the environmental stress-cracking test, and the field pressure test.

The Type II formulation, Tenite Polyethylene 2521E-60099, has a density of 0.939 and is priced at 35¢/lb. The Type III formulation, Tenite Polyethylene 2811E-80010, has a density of 0.950 and is priced at 38¢/lb. The National Sanitation Foundation has tested and approved both materials for the production of pipe suitable for transmission of potable water, the company states.

More PE film

Start-up of Dow Chemical Co.'s polyethylene film plants at Findlay, Ohio, and Fresno, Calif., sets the stage for greatly expanded distribution of this material by Dow and its Dobeckmun Co. Division. Trademarked Polyfilm, the film is produced in thicknesses from $\frac{1}{2}$ to 10 mils in a variety of widths for flexible packaging, building, agriculture, and other industrial uses.

According to Dr. W. C. Goggin, manager of the Dow Plastics Dept., available industry estimates indicate that the total market for PE film will soar to approximately 650 million lb. annually by 1965—more than double the 1959 figure.

Facilities at Findlay occupy 208,000 sq. ft. of a 42-acre site. The manager is Robert W. Van Sickle, who formerly headed Dow Plastics Technical Service operations at Freeport, Texas. At Fresno, the new plant and equipment occupy four acres of a 24-acre site. Film manufacturing formerly done by Extruders Inc., a Dow subsidiary near Los Angeles, Calif., has been transferred

to the new plant. The manager is William B. Sander, former president of Extruders Inc. Dow is using four established sales forces for the marketing of Polyfilm: to flexible packaging converters by the company's Film Sales staff; to end users in general industry by the Dobeckmun Co. Div. Sales; to the builder by Dow's Building Products Sales; and to the farmer by the company's Agricultural Chemicals Sales.

High-density PE compounds

An improved high-density polyethylene compound for wire and cable applications has been introduced by Union Carbide Plastics Co. Designated Bakelite DGD-4100, the new formulation is said to combine greater toughness, high abrasion resistance, reduced compressibility, and better heat deflection with greatly improved resistance to stress cracking and thermal brittleness. In standard IPCEA (Insulated Power Cable Engineers Assn.) tree wire tests, the new material is said to have withstood over 1,500,000 cycles—reportedly 50% better than other high density PE tested.

DGD-4100 has been approved as insulation for military telephone singles, as insulation for single-pair (C-Rural) telephone distribution cable, and as insulation for aerial spacer cable and tree wire, according to the company. The new formulation is also being used in service drop cable, line wire, coaxial cable, and high voltage power cable.

For pipe. Union Carbide Plastics Co. has also introduced a new high-density PE pipe extrusion compound, designated DGDA-2033 Black 4865. It is said to offer good long term stress properties, coupled with easy processibility in conventional equipment at high extrusion rates. This material is designed to meet the requirements of Type III pipe, Series 2 (75 p.s.i.) and Series 3 (100 p.s.i.) under the proposed revision of Commercial Standard 197-59, and is said to

carry the NSF seal of approval. According to the company, DGDA-2033 will enable pipe fabricators to extrude thinner wall pipe than with low- or medium-density polyethylene, while, at the same time, meeting the long term pressure requirements.

Phenolic shell molding resin

A new stable novolac resin developed especially for hot-processed sand coating is now available from Union Carbide Plastics Co., Div. of Union Carbide Corp. The new material, Bakelite phenolic resin BRR-7151, is said to have superior hot strength which allows faster cures and freedom from shell warping or cracking. Melt viscosities of the resin are said to provide good flow for higher shell or core strength. The resin is suitable for all types of hot coating equipment, the company states.

Uscolite slab stock

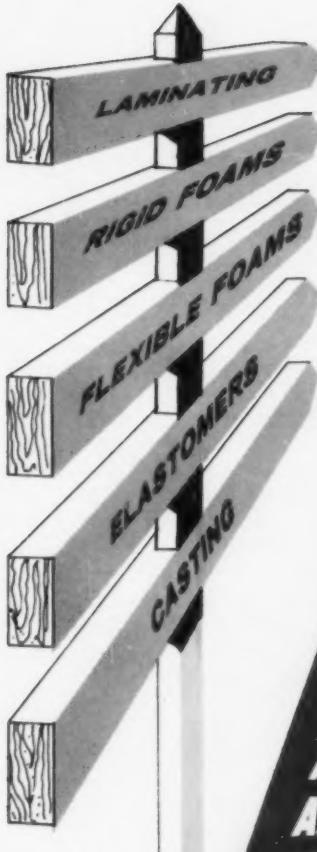
The mechanical goods division of United States Rubber Co. has announced several major additions to its line of ABS plastic slab stock, marketed under the trademark of Uscolite CP. The company is now offering fabricators 4-in. thick slab for the first time. This is the eleventh stock thickness offered by U. S. Rubber, the other 10 ranging in quarter-inch gradations from $\frac{3}{4}$ -in. to 3 inches. At the same time, the availability of all of the 11 thicknesses in 12- by 12-in. stock slab was announced. Previously, only 36- by 36-in. slab was available as stock items with smaller slab sizes produced on special order.

Uscolite CP is an acrylonitrile-butadiene - styrene copolymer blend that is used for pipe, valves and fittings.

Phenolic molding compound

An asbestos reinforced phenolic molding compound produced by Rogers Corp., Rogers, Conn., and called RX-495, has reportedly been approved for applications under Government specification MIL-M-14F, Type MFI-20. It is claimed that the material can be used in automatic preforming equipment, and preheats well with electronic preheaters. It can be used on (To page 218)

The reliable road to better plastics!



For weather, water, impact resistant reinforced plastics . . . rigid or resilient urethanes—whatever your laminating, foam, or elastomer requirements, ADM has a polyester resin formulation suited exactly to the job. Long a leading supplier of resins to the coating industry, ADM has the experience and facilities to help you profit. From ADM research come the newest developments for foams, hand lay-up and spray-up laminates. Pure, uniform products of highest quality and performance. And with plants and laboratories at five strategic points, you get prompt, expert service. So, for all your resin requirements, rely on ADM . . . for research, quality, and service.

**Archer-
Daniels-
Midland**

Chemical Group
RESINS • PLASTICS
INDUSTRIAL CHEMICALS

700 Investors Building
Minneapolis, Minnesota



THE PLASTISCOPE

(From page 216)

transfer and compression molds involving intricate details and is said to produce parts with very good appearance. Its characteristics include heat distortion temperature of over 500° F., molding shrinkage of less than 0.001/in./in., impact strength of 2.5 ft.-lb. (notched bar), and flexural strength of 12,000 p.s.i. RX-495 is being used in automotive and industrial gears, controls, and electrical switchgear, the company states.

Champion-Crown combination

After flirting with "plastics" for many years, Champion Paper & Fibre Co., Hamilton, Ohio, has now made definite moves in two directions. One was to obtain a license from Crown Machine & Tool Co., Fort Worth, Texas, to produce and distribute that company's famous Thermokups, which had been awarded a citation by the Plastics Industry for one of the year's most useful and unusual plastics products. The Champion license, obtained one year ago, includes distribution in all states except Texas and some bordering areas. Champion has now acquired Crown Plastic Cup Co., a former division of Crown Machine & Tool, for an undisclosed amount of Champion stock.

President of the new subsidiary is Charles G. Ellington, who is also president of Mid-West-Pak Corp., Belvidere, Ill., which manufactures Thermokups for Champion. J. H. Harrison, executive vice-president of Crown Machine & Tool and inventor of the cup, will remain as executive vice-president of the subsidiary, and W. M. Harrison will remain chairman. Mid-West-Pak doubled production recently and Fort Worth is again increasing its facilities.

The Thermokup was one of the first foamed bead polystyrene cups to attract widespread attention. It was used originally on airplanes for hot and cold beverage, and is now in demand almost beyond capacity production for use in in-plant feeding operations. Trade guesses on poundage of

polystyrene beads used for this cup are several hundred thousand pounds a month.

The other move by Champion was to enter the field of plastic-coated papers and plastic films. Champion's entry into this field is a polyethylene coating with a surface treated by a special process. Regular inks printed by standard processes anchor firmly to this surface, gleam brightly and give a third dimensional appearance of depth.

While the advantages of plastic-coated paper and food boards have long been known in these areas, lack of really good printing and gluing surfaces has been a drawback, according to Champion, who feels that these problems have been solved by its process.

At its plant at Waynesville, N.C., Champion is installing equipment for plastic extrusion coating of its papers. The extruder portion of this equipment gives Champion the ability to extrude other present-day plastics such as high density polyethylene, nylon, polypropylene, Teflon, vinyls, polystyrene and other plastic resins. And new plastics still in the laboratory stage are within the range of this modern plastic converting equipment. With the coating portion, Champion can plastic-coat paper in widths up to 85 in. and with a controllable range of coating weights from 1½ to 24 lb. per 1000 sq. feet. The coating line can be operated at speeds up to 1000 ft. a minute. And large rolls, 85 in. wide and 84 in. in diameter, can be produced.

New secondary plasticizer

Lower formulating costs and good performance characteristics with vinyl compounds are said to be possible with a new secondary plasticizer which is available from Monsanto Chemical Co.'s Organic Chemicals Division. Called Saniticizer 216, the new plasticizer offers formulators a low priced extender that is said to give good low-temperature flexibility, light stability, and low volatility to PVC plastisols and extrusions. It

is commercially available at 9¢/lb. in bulk shipments of 2000 gal. or more, FOB Monsanto, Ill.

Epoxidized plasticizer

A newly developed epoxidation process for the production of vinyl plasticizers was licensed by Becco Chemical Div., Food Machinery & Chemical Corp., to Wilson-Martin, Chemical Div. of Wilson & Co., Inc., for 2 years, renewable for 2-year periods.

Wraps for laundry

According to a survey conducted by an independent market research company for U. S. Industrial Chemicals Co., manufacturer of Petrothene polyethylene resin, 72% of a 1300 member consumer panel prefer receiving their dry cleaning and laundry wrapped in PE film rather than other wraps. High on the list of reasons given by consumers for their preference of PE film wraps is transparency, said U.S.I. Closely following this is protection against dust and water, ease of storage, strength and better appearance than competitive packaging materials, according to the survey.

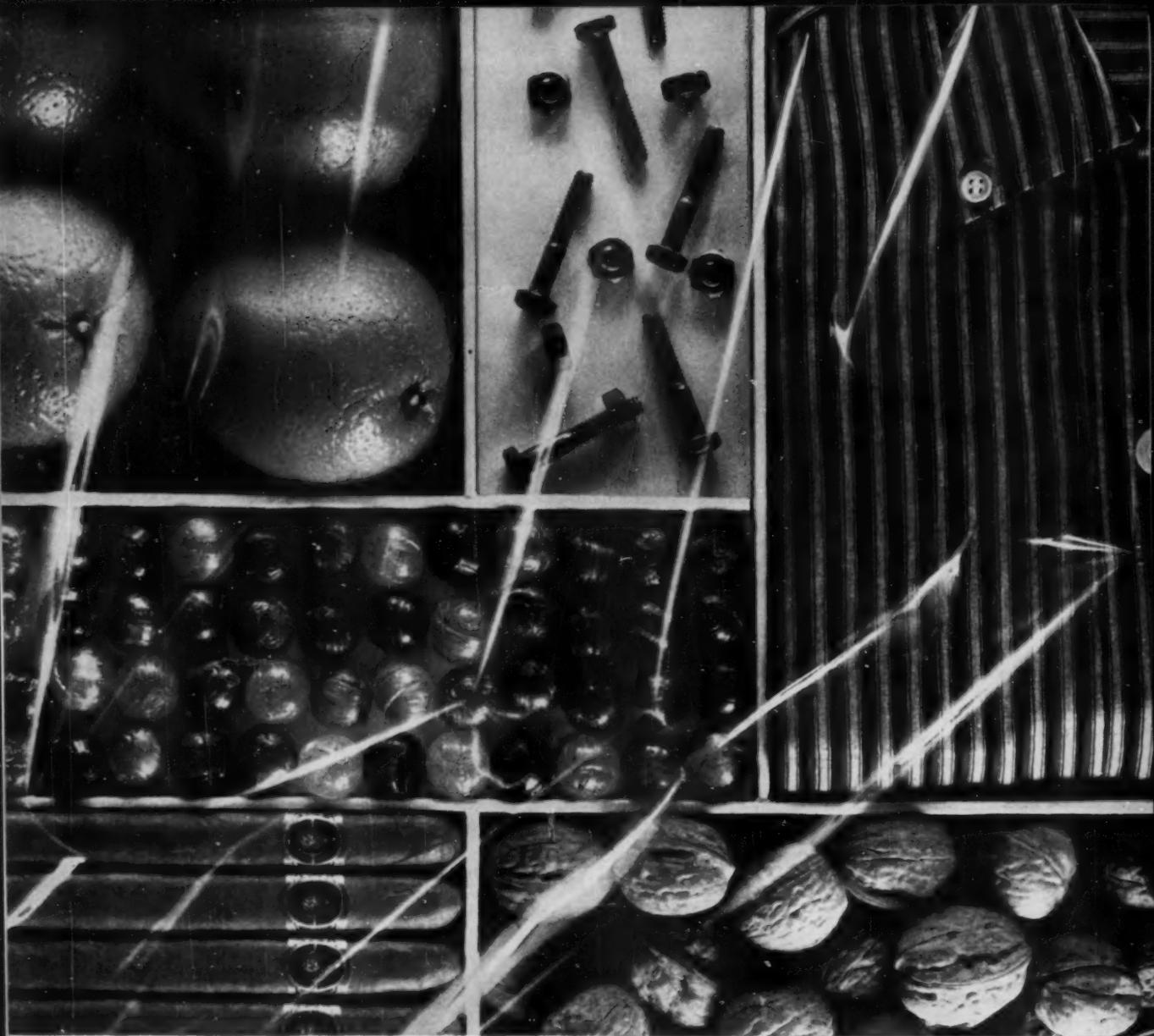
The panelists represent a cross section of consumers in 17 major cities coast to coast. In New York City alone, the preference for polyethylene is running better than 3 to 1. Chicago is over 7 to 1 and Los Angeles over 4 to 1.

The company further learned that 70% of those people, answering a mailed inquiry, reported receiving their dry cleaning and laundry in polyethylene. According to U.S.I. this indicates that the preference for PE by consumers is actually slightly greater than what is now offered by cleaners and launderers.

This type of demand is expected to result in an increase in the use of polyethylene by the dry cleaning and laundry industries, from the present consumption of 36 million lb. per year to 60 million lb. by 1965, U.S.I. states.

Glossy Kralastic

An easy-processing, high-gloss variety of its Kralastic ABS polymer blend has been announced by Naugatuck Chemical Div., U. S. Rubber Co., Naugatuck, Conn. The material, called (To page 220)



Two new **Monsanto**
Polyethylene[®] film resins, for high clarity packaging, promise the extruder up to 10-20% faster rates, excellent film gloss and clarity, and good openability. Monsanto Polyethylene 31 (intermediate slip) and Monsanto Polyethylene 32 (high slip) produce film with a broad heat sealing range that eases fabrication, reduces scrap, speeds up conversion rates. Ink reception is excellent, printability sharp and clear. For complete technical data on Monsanto Polyethylene 31 and 32 write to Monsanto Chemical Company, Plastics Division, Room 766, Springfield 2, Massachusetts.



MONSANTO DEVELOPER IN **PLASTICS**

THE PLASTISCOPE

(From page 218)

Kralastic MH, was specifically developed for molded and sheet consumer products.

All of the conventional ABS properties have reportedly been retained in the new grade. But the composition of the new material has been modified so that it can be molded at the high speeds needed in consumer goods fabrication; and parts molded from the new material also have the gloss and decorative appearance required in this market. Among uses suggested by the company for the new material are housings and component parts for home appliances and business machines, automotive trim and hardware, women's shoe heels, radio cabinets, telephones, sporting goods, and small wheels.

Injection molding will be the major processing technique used with the new material. Tests are said to show that it can be molded at approximately the same molding speed range as celluloses, impact styrenes, and polyolefins. The material is also easily vacuum formed and extruded, the company states. The new formulation can withstand exposure to temperatures up to 185° F.

Plastic smoke

The Dow Chemical Co. has acquired exclusive worldwide rights to commercial development of plastic smoke from the inventor, Miss Betty Lou Raskin, a research associate at The Johns Hopkins University Radiation Laboratory, Baltimore, Md. The smoke is made up of finely dispersed plastics particles. According to Dr. R. F. Boyer, director of plastics research for Dow, the company will continue research and development. Plans are still preliminary, but two general research possibilities are apparent: use as an artificial fog and recovery of small particles of plastics.

Low-cost chloro compounds

Free research quantities of new, low-cost chloro compounds with reactivity characteristics similar to benzyl chloride are being of-

fered by International Minerals & Chemical Corp., Skokie, Ill. IMC foresees applications of the new compounds in plasticizers, adhesives, mastics, caulking compounds, lubricant additives, and many other fields.

The bis (chloromethyl) product, a low-cost bi-functional compound, is potentially useful in all types of polymers, according to the company. It can first be converted to glycol. The methyl-naphthalene compounds are made with mixed methylnaphthalenes.

Stripper for organic coatings

A stripper for removing epoxies, acrylics, alkyds, and baked enamels from aluminum, and other metals has been developed by Esbec Corp., Stamford, Conn. Called Speedi-Strip #1010, it is the bond releasing type, and reportedly does not deteriorate. Once the bond is broken, the coating flushes off cleanly under a water spray, the company states. It is used at room temperature and is said to be non-flammable.

More colors for Micarta

The addition of 23 new colors and patterns to its Micarta line of decorative laminated surface materials has been announced by the Westinghouse Electric Corp. This brings the total to 64 colors. Like previous colors and patterns, they will be available from U. S. Plywood Corp., distributor of these decorative products in the United States. Increased contemporary interest in marble finishes has led to a new marble design in five colors. Another new pattern has traces of gold across some basic colors and additional wood grain colors include maple, cherry, walnut, rosewood, and mahogany.

Vinyl film for fabrics

Wall covering made of natural fibers and textured fabrics, genuine grass cloth, and slubbed linen is now protected against fading dirt, and other injury by a transparent layer of scrubbable vinyl film. Polyplastex United Inc., Union, N. J., manufacturers

of the wall covering, has introduced its new Royaltex patterns, including designs utilizing genuine butterflies, leaves, and sea heather against simple textured backgrounds covered by a 0.004-in. layer of Union Carbide Plastics Co.'s Krene vinyl film which is laminated to the fabric.

Provides matte finishes

A new process that provides matte finishes on molded thermosets plastics has been developed by Norton Laboratories Inc., Lockport, N. Y.

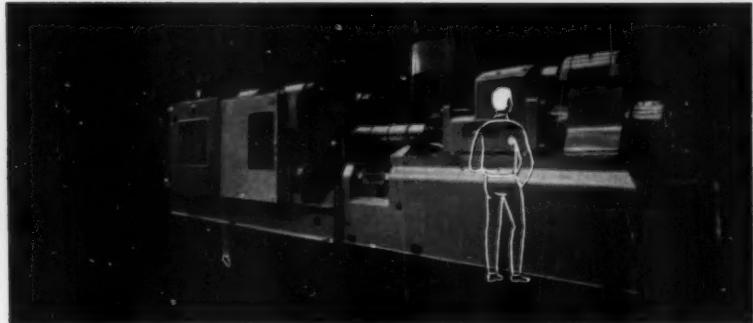
In the industrial field where non-glare is a desirable characteristic for instrument covers, matte-finish parts often can eliminate supplementary painting operation. Other applications include piano keys, knobs for lamps, and cameras, which require a non-glare, non-reflecting interior surface to avoid spoiling light-sensitive photographic film.

Clear coating for metals

A clear epoxy polyester coating designed for protection of both treated and non-treated decorative aluminum products and surfaces, as well as brass and other metals, is available from John L. Armitage & Co., Newark, N. J. The original luster of the base metal is reportedly retained with the use of the coating which is said to have a high degree of mar resistance as well as resistance to burns, cracking, and staining. The flexible epoxy is claimed to withstand a $\frac{1}{8}$ -in. bend. The coating can be applied by either spray or dip. It is baked for 3 to 15 min. at temperatures of 350° F.

Nylon bars to cost less

Price reductions up to 50% on nylon tubular bars were announced by The Polymer Corp., Reading, Pa. The new prices, which are said to bring the cost of nylon tubular bars to 15% below that of quality bronze bushings of similar size, apply to a nylon compound formulated especially for bearing uses. Designated Polypenco MC nylon 901, the material is said to be lightly cross-linked, and to provide improved resistance to deformation under load and wear characteristics, and better di- (To page 222)



A new day dawns.

A new age has begun - the AGE OF PLASTICS.

Krauss-Maffei have realised this trend and have undertaken to build machinery - especially large machinery - of highest quality for the processing of thermoplastic materials.

Krauss-Maffei are continually expanding their production programme. The following machine types are now available: -

Single Screw Preplasticizing Injection Moulding Machines:

The types V 40-550, V 74-550 and V 90-1000 cover injection volumes from approximately 450 to 4550 ccm.

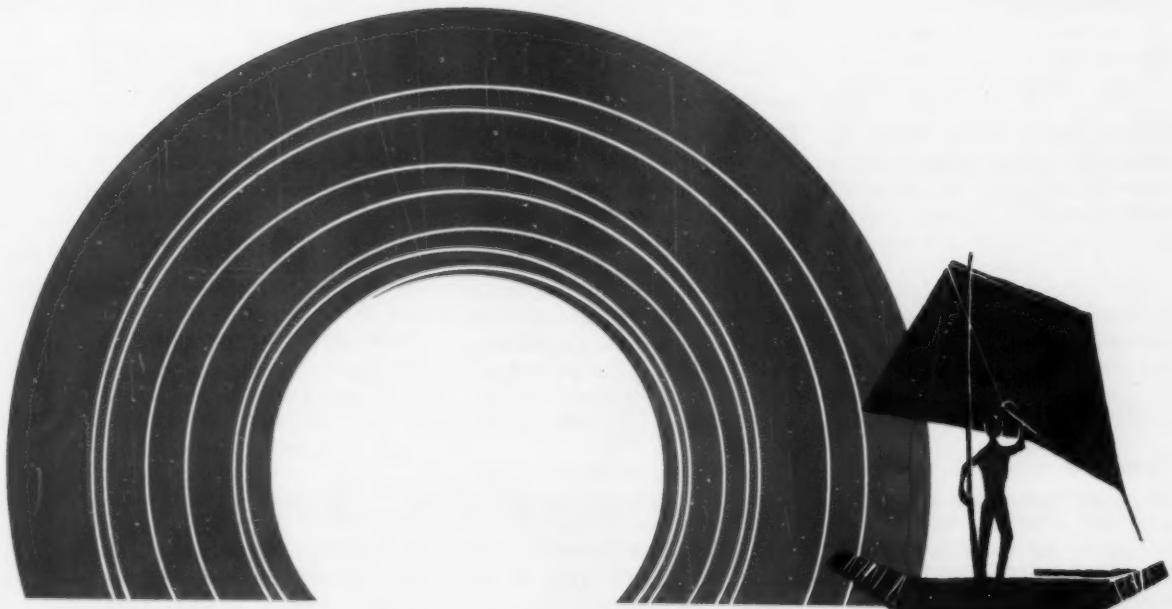
High Capacity Internal Batch Mixer PM 50.

The construction of this machine, differing from the customary design, meets particularly requirements for calendering and of floor tile manufacturers. Output up to approximately 4400 lbs/hr.

Injection and compression moulds up to largest dimensions meet the demands of the latest processing technics.

Please ask for detailed information.

KRAUSS-MAFFEI MÜNCHEN



THE PLASTISCOPE

(From page 220)

mensional stability than standard nylon compositions. It will be supplied in a blue color to distinguish it from the company's other nylon formulations.

The MC nylon tubular bars are now available in outside diameters ranging from 2 to 15 in., in standard wall thicknesses of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, and 1 inch. Wall thicknesses up to 2 in. can be made to order. Standard length is 8 in. for inside diameters under $1\frac{1}{2}$ in., and 13 in. for larger sizes.

Besides bearing uses, the company foresees markets in gears, thrust washers, seals, valve seats, and other nylon applications.

Butyrate for auto lenses

Replacement lenses for lighting devices on trucks and automotive vehicles, made of butyrate, have now been approved in the state of California. The plastic is supplied to molders and extruders by Eastman Chemical Products Inc., subsidiary of Eastman Kodak Co., Kingsport, Tenn. California's approval covers the use of the material in taillights and back-up, turn-signal, and parking lights.

Cast nylon for large parts

Nylon Molded Products Corp., Garrettsville, Ohio, is introducing cast nylon parts for large pieces of machinery under the trademark of Nylocast—a licensed European process. The technique uses high viscosity nylon yet there is said to be no limitation to cast-in inserts, threads, lugs, intricate shapes, or varying thicknesses. The company claims that this process will mitigate the cost of expensive molds and equipment as well as restriction to large volume runs typical of injection molded nylon. N.M.P. has long been one of the country's outstanding producers of molded nylon parts.

Structural sandwich course

An intensive one-week course on structural sandwich design and fabrication sponsored jointly by the Dept. of Engineering and Engineering Extension, Univer-

sity of California, Los Angeles, Calif., will be held at the University from July 11 through July 16. The course is intended for engineering personnel and a B.S. degree in engineering or physical sciences is a prerequisite. Registration fee is \$100, including course material. Additional information can be obtained from Engineering Extension, Room 6266, Engineering Bldg., Unit II, University of Calif.

PVAc plaster filler

A white polyvinyl acetate paste called Max-Tic Crack Fill, and designed to fill cracks around bath tubs and sinks, to grout plastic wall tile, and to fill cracks in plaster and wood, is now available from McCarten Industries Inc., Chagrin Falls, Ohio. The new compound dries white and waterproof. Application is simple with an 8-oz. PE squeeze tube in which the compound is packaged.

Installs giant dip tank

A dip tank said to be world's largest tank for PVC dip coating of metal products has been installed by Quelcor Inc., Chester, Pa. This tank was put in operation to handle single pieces up to $6\frac{1}{2}$ ft. long. By controlling preheat temperature of the part and time cycles, single layer coatings of from $\frac{1}{16}$ to $\frac{1}{4}$ in. can be applied.

New UV absorbers

Uvinil N-35 and N-38 are the first two products of a new family of ultraviolet absorbers, available from the Dyestuff & Chemical Div., General Aniline & Film Corp., New York, N. Y. Chemically identified as substituted acrylonitriles, the new UV absorbers do not contain acidic aromatic hydroxyl groups and are said to show excellent UV absorption properties under varying pH conditions.

The two new products are said to be particularly suitable for protecting nitrocellulose lacquers against UV degradation without adding undesirable color to the coating. According to the com-

pany, these ultraviolet absorbers may also be of use in other systems such as melamine-formaldehyde, urea-formaldehyde, epoxy-amine, nylon formulations, and butadiene-styrene latex.

Stops static electricity

A sprayable compound said to neutralize static electricity is available from Statikil Inc., Cleveland, Ohio. The product is suggested for spraying on plastics auto seat covers and chairs with rolling casters. It is said to keep dust off acetate and phonograph records, prevent plastics bags from adhering, etc. Statikil is said to dry instantly and invisibly. The compound costs \$3.00 per 12-oz. can, and in bulk (unpressurized) for production work, it costs \$15 per gallon.

Spray bonder

A new primer and sealer that dries within 20 min. is now available under the trademark XIM spray bonder from the H. Forsberg Co., 5103 Lakeside Ave., Cleveland, Ohio. The manufacturer states that this bonder will successfully prime surfaces that hold paint only with unusual difficulty, such as phenolic.

Vinyl tub lining

Rugged vinyl coating is now used as a tub lining in place of porcelain in the newest models of the dishwasher-dryer marketed by Waste King Corp., Los Angeles, Calif. It is also applied to the door lining and racks. The vinyl plastisol acts as an extra barrier to heat, moisture, and sound.

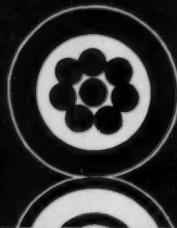
The coating is based on Geon vinyl resin, manufactured by B. F. Goodrich Chemical Co., a division of The B. F. Goodrich Co. Formulator for the vinyl plastisol is Michigan Chrome & Chemical Co., Detroit, Mich.

Seek all-plastic missile

CTL Div. of Studebaker-Packard Corp., and Amcel Propulsion Inc., a new subsidiary of Celanese Corp. of America, have joined in a proposal to the Ordnance Materials Research Office which could result in development of an all-plastic multi-stage missile. The proposal, submitted as a united endeavor, (To page 226)

" **QUALITY**
SUREST PROTECTION
UNDER THE SUN!

SPECIFY  DISPERSIONS
FOR WIRE AND CABLE



Only a uniformly fine dispersion of carbon black can assure year after year protection to plastic insulated wire and cables that are exposed to sunlight. Maximum resistance to harmful ultraviolet radiation depends upon the concentration of carbon black used, its particle size, and the thoroughness with which it is dispersed. Uniform dispersion of microscopic carbon black particles in "ADP Quality" concentrates will control oxidation and subsequent degradation of plastic wire coating giving you the highest product quality.

ADP concentrates of carbon black assure equally

superior protection for plastic filament, pipe, and blown or flat film extrusions. In addition to carbon black dispersions in polyethylene, polyvinyl chloride, polystyrene and other resins, Acheson also supplies "ADP Quality" dispersions in electrical code colors. Send for a sample "ADP Quality" dispersion and see the difference... or let Acheson specialists work with you to solve your special vehicle or resin dispersion problems.



801



ACHESON DISPERSED PIGMENTS CO.

1617 PENNSYLVANIA BLVD., PHILADELPHIA 3, PA.

In Europe: Acheson Industries (Europe) Ltd. & Affiliates, 1 Finsbury Square, London, E. C. 2, England

QUALITY DISPERSIONS MEAN QUALITY PRODUCTS



It's a "One-Book Library" on Plastics

...always within easy reach

It's all here in your 1960 MODERN PLASTICS ENCYCLOPEDIA ISSUE expertly classified and easy to use...the equivalent of many books and articles combined into one volume. Here is all the essential information you need to help you in your work—full editorial coverage of all phases of plastics technology, complete with unique charts, tables and diagrams.

Read previously unpublished articles on the newest trends and latest developments, written by recognized authorities. Consult sections giving complete descriptions of physical and chemical properties of plastics materials...detailed data on materials selection...analyses of the suitability of various materials in terms of final applications...principles of product design for plastics. There's a completely up-to-date Buyers' Directory...hundreds of specially prepared fact-filled advertisements.

Yes, it's *all* here in a "one-book library" on plastics. Reach for it often. Consult it with profit.

MODERN PLASTICS ENCYCLOPEDIA ISSUE FOR 1960

1961 ISSUE—PUBLISHED SEPTEMBER 1960



In plastics... Wheelco "Extras" pay off



Flambeau Plastics Corporation chose **WHEELCO for FLEXIBILITY**

Electronic components... household furnishings... sports equipment... lawn mower parts. These are but a few of the many industrial and consumer plastic products produced by the Flambeau Plastics Corporation, Baraboo, Wisconsin, with plants at Baraboo and Milwaukee. Because temperature control and instrumentation flexibility are so important to top-quality plastic products, Flambeau has specified Wheelco instrumentation for their battery of 25 injection molding machines and for their plastics extrusion department. Flambeau has found that Wheelco instruments provide the temperature accuracy necessary even for plastics having sharp breaking points. Flambeau records show a product rejection rate far lower than is average for the industry. You, too, can expect this type of instrumentation efficiency and reliability with Wheelco. Contact your nearest Wheelco sales office or write direct for complete information.

Industrial Instruments
Automatic Controls
Air Distribution Products
Aircraft Controls
Electrical Components
Small Motors
Overdoors and Operators
Molded Products
Metal Cutting Tools
Machine Tools
Textile Machinery

THE MARK OF QUALITY

**Barber
Colman**
**Wheelco
Instruments**

BARBER-COLMAN COMPANY

Dept. F, 1517 Rock Street, Rockford, Illinois, U.S.A.
 BARBER-COLMAN of CANADA, Ltd., Dept. F, Toronto and Montreal, Canada
 Export Agent: Ad. Auriema, Inc., N.Y.

THIS
CATALYST HAS
LONG HALF LIFE
AT
HIGH TEMPERATURE

LUPEROX®
2,5 Dimethyl- Hexane -2,5 Dihydro Peroxide

Luperox 2,5-2,5 fills the demand for a solid, non-volatile high temperature hydroperoxide polymerization catalyst. Its half life (in benzene) at 215°C is 1000 hours. Its 16.1% active oxygen content and ability to dissociate into free radicals make it an excellent polymerization initiator.

Exotherm measurements (S.P.I. procedure) at 212°F. and 266°F. in many unsaturated polyester resins show LUPEROX 2,5-2,5 falling between t-butyl perbenzoate and di-t-butyl peroxide in ability to initiate polymerization.

Has wide potential applications including those in the polyester, polyvinyl, rubber and silicone industries.

Write for Data Sheet or Consult
Chemical Materials Catalog Page 199
for details

LUCIDOL DIVISION



WALLACE & TIERNAN INCORPORATED
1740 MILITARY ROAD
BUFFALO 5, NEW YORK

THE PLASTISCOPE

(From page 222)

resulted from a request by OMRA, Watertown Arsenal, N. Y., for proposals concerning investigation and development of plastic materials for use in solid propellant rocket motors and missiles.

The two companies offered immediate ability to launch the research and development program. The over-all plan envisioned by CTL and Amcel involves five phases: basic research on materials, plastic rocket motor development, plastic missile body development, integration of components, and flight test.

Container Institute formed

The formation of an Industrial Container Institute in The Society of the Plastics Industry Inc. has been announced by Jerome S. Heisler, newly elected Institute chairman and vice-president, Delaware Barrel & Drum Co. Inc., Wilmington, Del. Other Institute officers include B. Neal Harris Jr., vice-chairman and vice-president of Hedwin Corp., Baltimore, Md.; and Richard S. Griffith, chairman, Institute specifications Committee, and assistant product manager, industrial containers of the Plax Corp., Bloomfield, Conn.

This group of plastic container manufacturers is concerned with plastic containers of 1-gal. capacity and larger, and is not to be confused with the Plastic Bottle & Tube Mfr.'s Institute, which is also a division of S.P.I., but which deals exclusively with plastic bottles and tubes in such fields as detergents, cosmetics, disinfectants, etc., and which are of smaller capacity. The Institute will be initially concerned with the development and approval of commercial standards on plastic shipping containers for industrial and governmental uses.

While sales of industrial plastic containers totaled approximately \$5 million last year, a 25% increase is forecast for 1960.

Acrylic letters

Introduction of a complete stock alphabet of 14-in. round faced plastic letters made of Rohm & Haas Plexiglas acrylic for outdoor or indoor sign use (To page 228)

NEW! "XL-modified" NLC Stabilizers upgrade performance of proven vinyl insulations

Aid color, simplify processing, too!

Today, everyone from the electrical contractor to the missileman wants to cram more power through wire with thinner vinyl insulation. This means the manufacturer must continue to produce better and better vinyl insulation.

Now, from National Lead Stabilizer research, comes word of a significant development in this direction... a modification applicable to five of the eight National Lead Stabilizers widely used for insulation. These are DYTHAL®, DYPHOS®, LECTRO® 60, TRIBASE® and TRIBASE-E® Stabilizers.

This modification greatly improves the effectiveness of the stabilizer in dielectric vinyl compounds and raises the performance level of the insulation. To designate the modified stabilizer the letters "XL" are used. For example, the modified *Tribase Stabilizer* is *Tribase XL Stabilizer*. The new "XL" Grade Insulation Stabilizers call for no changes in proven formulations, yet with them, the *performance* of your proven formulations can be markedly improved.

The "XL" Grade Insulation Stabilizers produce the following improvements:

1. Increase heat stabilizing action.
2. Increase retention of desired physical properties in the insulation during heat aging.
3. Improve natural color of compound both initially and after processing and aging.
4. Step up on-wire electrical resistivity.
5. Ease processing... particularly extrusion.

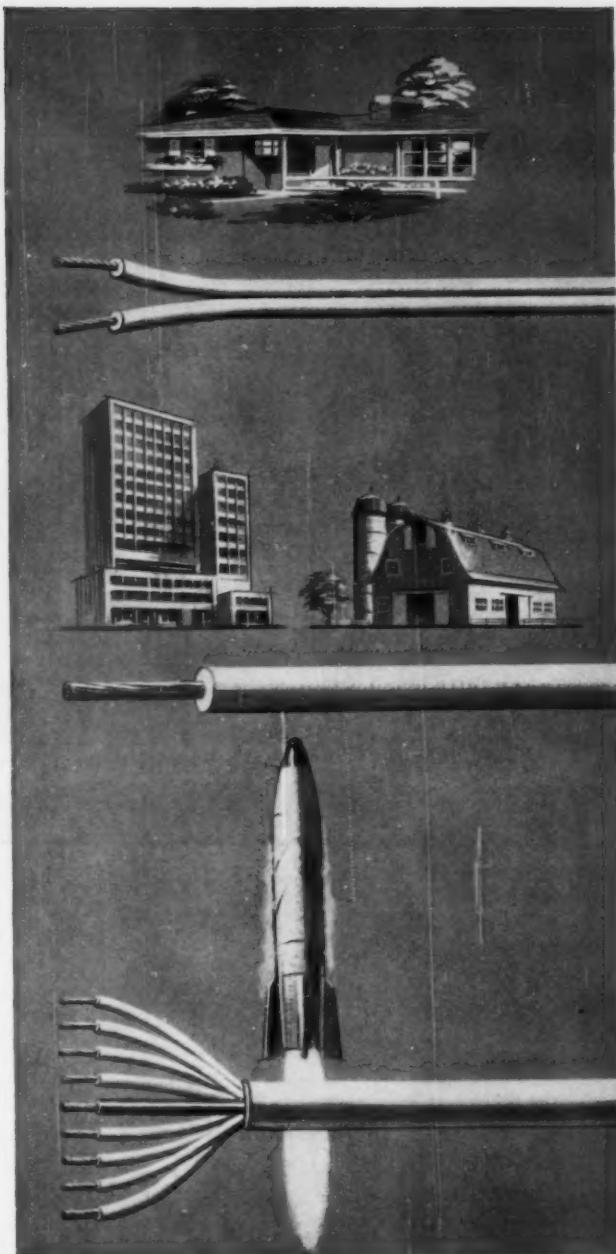
Information on the new "XL" Grades is provided in a new NLC data sheet. If you would like a copy, simply let us know with the coupon below.

National Lead Stabilizers for Vinyl Insulations

(> indicates stabilizers available in both standard and "XL" grades)

- DYTHAL® Stabilizer for all classes up to 105°C primary insulations.
- DYPHOS® Stabilizer for top-notch light-and-weather-resistant jacketing.
- LECTRO® 60 Stabilizer provides economy in 60°C and higher-rated vinyls.
- TRIBASE® Stabilizer is the quality heat stabilizer up through 90°C insulations.
- TRIBASE-E® Stabilizer is the general purpose heat stabilizer for primary insulation.
- LECTRO® 77 Stabilizer meets requirements up through 80°C insulations.
- LECTRO® 78 Stabilizer improves special high-temperature stocks including vinyl tapes.
- DS-207® Stabilizer-lubricant improves heat stability and extrusion characteristics.

®Trademark



KC-6792



National Lead Company: General Offices: 111 Broadway, New York 6, N. Y. In Canada: 1401 McGill College Ave., Montreal.

Gentlemen: Please forward your new data sheet on "XL" Grade National Lead Company Stabilizers for vinyl electrical insulations.



Name _____ Title _____

Firm _____

Address _____

City _____ State _____

"XL" Grade Insulation Stabilizers

A Chemical Development of

National Lead Company

General Offices: 111 Broadway, New York 6, N. Y.



Solve your Plastic Marking problems

with **KENSOL**
HOT STAMPING PRESSES

Kensol Presses are available in three pressure ranges: Light-Weight, Medium-Weight, and Heavy-Duty.

The proper model is available to meet any production requirements: Hand-operated, Air-operated, Semi-Automatic & Completely-Automatic.

Compressed air operation, adjustable electric dwell-timer, thermostatic heat control and rugged construction are a few of the features which assure fine quality marking.

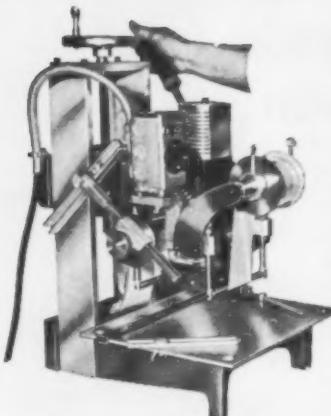
and

OLSENMARK ROLL LEAF

Fine quality, economically priced roll leaf in genuine gold, imitation gold and silver, and both flat and Enamel pigment colors.

Write for complete literature!

Specialists in Quality Marking Equipment and Supplies for over 30 years



KENSOL 15

Light-Weight
Hand-Operated Press

OLSENMARK
Corporation

124-132 WHITE ST., NEW YORK 13, N. Y.



A complete blown film installation available as a package unit.



Write, wire or call

PLASTIC MACHINERY CO., INC.

58 Rantoul Street, Beverly, Massachusetts

THE PLASTISCOPE

(From page 226)

has been announced by Premier Plastic Mfg. Co., Minneapolis, Minn. Style of the letters is standard Egyptian, made up in plain, flanged, and contour flanged types, and also for mounting with metal plates, plastic brackets, studs, or for free standing use.

Reports peak sales

Lester Engineering Co., Cleveland, Ohio designer and builder of injection molding machines, reports that 1959 sales reached a new peak at \$7,730,076, and were 43% above 1958. Earnings climbed to \$245,504, or \$1.29 a share, from \$122,353, or 64¢ a share in 1958. The company has started an expansion program and also entered into a license agreement with John Brockhouse & Co. Ltd., England, to build and sell Lester machines in England.

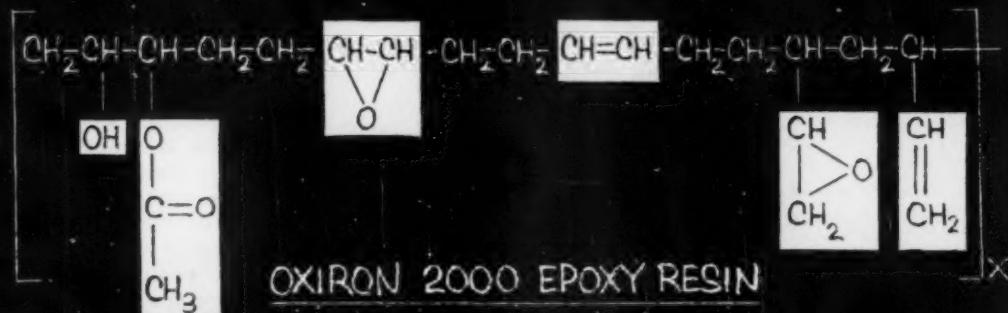
Rubber Corp. acquired by Swiss group

Controlling stock in the Rubber Corp. of America, Hicksville, N. Y. supplier of plastisol, plasticizers, and vinyl polymers and copolymers, has been acquired by a Swiss group led by Oerlikon-Buehrle, manufacturer of extrusion equipment and other machinery. The Swiss group also has a strong financial interest in Dynamit A.G., Troisdorf, Germany, a leading European manufacturer of plastics raw materials and plastics products.

Melamine and epoxy toolings

The cost of toolings can be reduced by reinforcing the epoxy-faced pattern with a Calcerite casting compound, according to Furane Plastics Inc., Los Angeles, Calif. These casting compounds, manufactured by Furane, are basically melamine and certain mineral fillers. The addition of a catalyst permits the casting of large sections and curing them with a minimum of shrinkage, according to the company. The cost of these compounds is said to be considerably below those of epoxies. Calcerite is not as tough as an epoxy resin, but will serve satisfactorily as a back-up material and reinforce-(To page 230)

FMC ANNOUNCES VERSATILE NEW EPOXY RESINS



Schematic formula of OXIRON Resins

OXIRON Epoxy Resins Offer Multiple Reaction Sites Plus Unique Vinyl Reactivity

OXIRON 2000 Series Resins are Highly Reactive.

The unusual molecule of FMC OXIRON Resins affords 10 or more reaction sites. They can be cured through reactive double bonds as well as epoxy and hydroxyl groups. Multiple epoxy groups are located at external positions and internally along the hydrocarbon backbone.

Unlike conventional epichlorohydrin epoxies, OXIRON Resins are epoxidized polyolefins. Because of their unusual combination of properties, they offer many new application possibilities.

OXIRON Resins Offer the Following Advantages:

Novel Cure: Can be peroxide cured through reactive double bonds as well as with conventional epoxy curing agents—high reactivity with anhydrides and dibasic acids at low temperature—increased pot life with polyamine cures—reactive with a wide variety of other curing agents, e.g., polyphenols, Lewis-type catalysts, polysulfides.

Economy: Low-cost curing agents may be used in high proportions.

Low Density: 20% lighter than ordinary epoxies—cured resins likewise have lower density.

Outstanding Chemical and Electrical Resistance:

Superior High Temperature Performance: Combination peroxide and anhydride cures give high heat distortion point resins. The unique flatness of the heat distortion curves of OXIRON Resins translates to acceptability for practical use at temperatures ranging far above the heat distortion point itself. OXIRON Resins show superior high temperature aging.

Send for our *FMC Epoxy Data Booklet* which describes OXIRON 2000, 2001 and 2002 in detail, contains curing information and gives suggested uses. After deciding which resin will best suit your needs, we will supply laboratory samples upon request.



FOOD MACHINERY AND CHEMICAL CORPORATION

Epoxy Department (MP-6)

161 East 42nd Street, New York 17, N. Y.



RC was there...

Looks like pure magic — but it's pure science. Behind the fine performance of a plastic garden hose lies the expertness of RC research. Before your extrusion faces consumer use, we test and retest. And our work is not finished until your basic product incorporates those essential qualities that insure best possible product performance. RC Plastisols, Plasticizers, Comonomers, and Insular Vinyl Polymers and Copolymers can be utilized in a vast range of applications. We invite your inquiries for advice, technical bulletins and samples. Whether we have the final answer in stock or we come up with a modified or custom-made formula, the quality and performance of your product will prove . . . RC was there!

Now available: New booklets on "RC Plasticizers and Comonomers," "Insular Polymers and Copolymers."

READY . . . RELIABLE . . . RC SERVING AMERICAN INDUSTRY SINCE 1930
RUBBER CORPORATION OF AMERICA
 New South Road, Hicksville 1, New York Sales Offices: New York • Chicago • Boston

THE PLASTISCOPE

(From page 228)

ment for epoxy faces. Patterns prepared in this manner are being used by aircraft and missile manufacturers, and in foundry and metal working establishments, Furane states.

Extrusion developments

New multicolor extrusions now enable product designers to obtain components such as radio and appliance dial-scales, cabinet and panel moldings, handles, pen barrels, and decorative trim with two-tone effects. Any combination of two opaque or translucent colors, or crystal-clear plus any color, can be specified. The second color portion is not a thin surface effect but is said to be an integral part of the extrusion, several mils thick. Trademarked Twin-Tint, the extrusions are made to customer's specifications in most thermoplastic materials by Anchor Plastics Co. Inc., Long Island City, N. Y.

The company has also developed a new technique for extruding large hollow objects, such as a rectangular tube 3 in. by 7 in., made of high-impact polystyrene. Some applications for which this process is suited are ducts, dispensing displays, and containers where more than one height is required. In the latter case the single, relatively low tooling cost for the extrusion, plus a single injection mold for a base and cover, are all that is required for a whole series of containers, the company states.

Plastics Institute

A Plastics Institute that can function on a basic research level and as a training ground for technical personnel has long been a favorite topic of conversation in the plastics industry. The idea is now moving out of the talking stage and into the planning phase. At a recent conference in New York City, an independent committee drawn from all segments of the plastics industry announced that detailed plans for such an Institute had been formulated. Members, under the chairmanship of Prof. Louis F. Rahm, Professor of Me- (To page 232)

Sandee POLY-LITE®

STOCK SECTION (Left): Many Sandee Poly-Lite® standard sections are carried in regular stock - you get immediate delivery without paying a premium. There are no die casts or set up charges on any Sandee Poly-Lite® stock panels - you have a wide variety of patterns to choose from. Sandee stock Poly-Lite® panels are supplied cut to your specifications.

2 COLOR EXTRUSIONS (Right): New thinking and new applications in multi-colored extrusions offer unlimited design possibilities.

CUSTOM SECTION (far left): You create it . . . we'll make it. There is no substitute for the experience Sandee has gained thru the years. Our experienced technicians and skilled craftsmen are at your service.

EMBOSSED PATTERNS (far right): We have what the industry needs for good lighting . . . hiding power, low brightness, diffusion and high efficiency.

Write today for a copy of our complete extrusion folder and price lists.

Phone NEVADA 8-4655
Sandee MANUFACTURING COMPANY
 735 SOUTH KARLOV AVE. • CHICAGO 24, ILLINOIS

STAMPING ON PLASTICS GOT YOU "WALKING A TIGHT ROPE"



If you need the economy of imitation gold yet desire the quality and glamour of genuine gold, LUSTROFOIL is your best solution. This remarkable imitation gold is non-tarnishing and non-fading. It offers absolute color stability and a brilliance equalled only by genuine gold.

Also available in aluminum, copper, red, blue, green

Write for sample & illustrated literature

GENERAL ROLL LEAF
Manufacturing Co.

Genuine and Imitation Gold and Silver, Pigment and Metallic Colors
 85-03 57th Ave. Elmhurst, L. I., N. Y. HAvermeyer 9-6123
 BOSTON • CHICAGO • LOS ANGELES

Complete automatic mold and cylinder temperature control
 ... with **SARCOTROL**



SARCO
 COMPANY, INC.

635 Madison Ave., New York 22, N. Y.

With Sarcotrol Automatic Temperature Control a dial setting gives you *quality control*, and helps to free your production from the problems of *sticking, shrinkage and crazing*.

Sarcotrol helps you step up output, and cut down rejects. New, higher cooling capacity makes the Sarcotrol suitable for calender rolls and large molds.

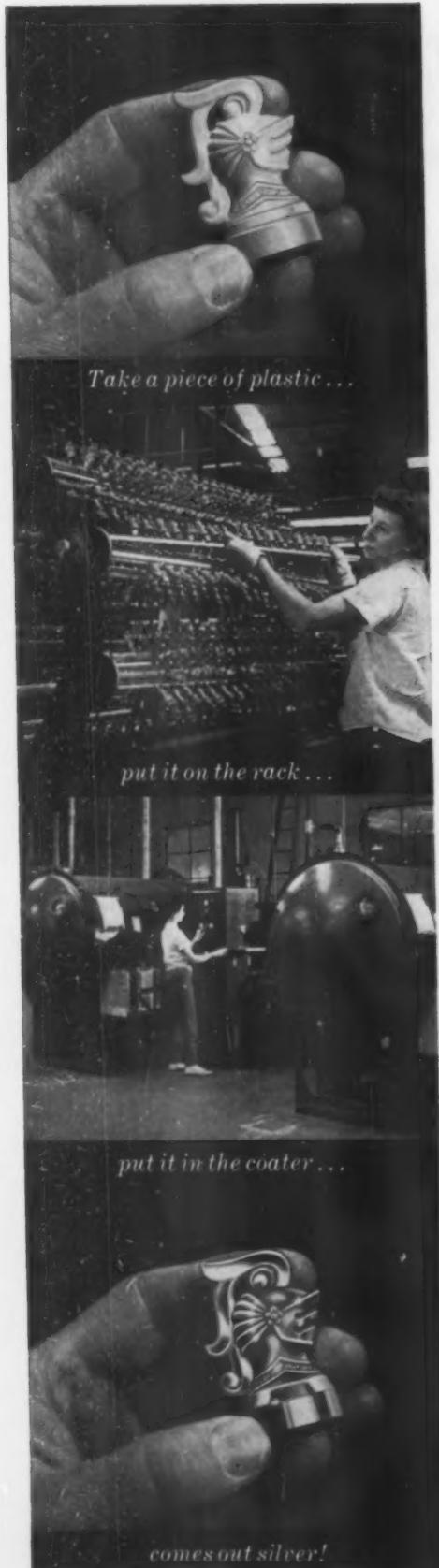
Write today for full Sarcotrol information and get the latest details on Sarcotrol Heating and Cooling Unit, plus new specifications.

**SARCOTROL GIVES YOU
 8 MAJOR ADVANTAGES**

1. Single knob adjustment of simple, selective control
2. Automatic 3-stage temperature control system
3. Recirculating, pressurized water system
4. Heat exchanger cooling adjustable to load
5. Higher temperatures - by controlling pressures
6. New economy of electricity and water
7. Sensitive system reaction - fast response
8. Automatic maintenance of correct temperature to protect product quality

9742

TEMPERATURE CONTROLS • STEAM TRAPS • STRAINERS • HEATING SPECIALTIES



PLASTIC TO SILVER

*...pennies
per thousand,
thousands per hour*

Perfection Finishing Corporation, Wauseon, Ohio, keeps a bank of large CVC coaters busy full time, putting lustrous, luxury metallic finishes on plastic. Everything from closures to car ornaments. Each coater metallizes hundreds of pieces per cycle, 4 to 6 cycles an hour. And it takes less than a dime's worth of metal to coat a thousand. Top quality, of course—as attested by increasing business for Perfection, and additional CVC coater orders from Perfection.

There's a complete line of CVC coaters—laboratory size to 72" mammoth—to meet your needs. Just write for our Metallizing Bulletins.

**Consolidated
Vacuum**

ROCHESTER 3, NEW YORK

THE PLASTISCOPE

(From page 230)

chanical Engineering at Princeton University, who worked up the plans, included: A. A. Hutchings, F. J. Stokes Corp.; J. H. Du Bois, Tech-Art Plastics Co.; Ralph L. Mondano, Raytheon Co.; W. O. Bracken, Hercules Powder Co.; D. B. Hanson, E. I. du Pont de Nemours & Co. Inc.; J. L. Formo, Minneapolis-Honeywell Co.; J. W. Lindau, Southern Plastics Co.; and George Smoluk, Engineering Editor, MODERN PLASTICS magazine. Prior to the conference, an informal survey on the materials supplier, machinery manufacturer, custom molder, and end-user level indicated some desire for an Institute that could do long-range basic research into the nature and characteristics of plastics materials and other significant aspects of the science and engineering of plastics and could concern itself with the education—at the graduate school level—of qualified plastics engineers and chemists. Committee members who spoke at the conference, as well as such other speakers as John W. LaBelle, Foster Grant Co. Inc.; S. E. Q. Ashley, General Electric Co.; and Dr. Gordon M. Kline, U. S. Bureau of Standards and Technical Editor, MODERN PLASTICS, further emphasized these needs.

The committee has launched a drive to inform the industry of the purpose and set-up for an Institute of this type. Starting this month, individual firms in the plastics industry will be solicited as to their interest and willingness to underwrite an Institute of this type.

Intermediate for plasticizers

A highly reactive polyfunctional acid, 1,2,3,4,Tetracarboxybutane (T.C.B.) said to be useful for the preparation of esters having potential applications as plasticizers and high temperature lubricants, is now available from Abco Chemical Co., Jersey City, N. J. Potential applications in the coatings industry include preparation of alkyd resins and polyesters which may be used in resin manufacture and urethane formulations. The acid (To page 234)

Can it be sleeping that's making you tired?



... Time to wake up and let PEERLESS show you what's new in Plastics Marking.

We at PEERLESS have developed a roll leaf that resists wear . . . oil and alcohol stain . . . perspiration . . . and most every type of punishment possible.

PEERLESS Roll Leaf Company has marked practically every type of plastic . . . has made equipment for marking most every size and shape of plastic product . . . and continues to be first in their field with new advancements in plastics marking, and the manufacture of plastics marking machinery.

Come on now, sleeping is all right at home, but not during a working day . . . wake up . . . call or write PEERLESS . . . let us tell you "what's new".



Achievement toward Perfection

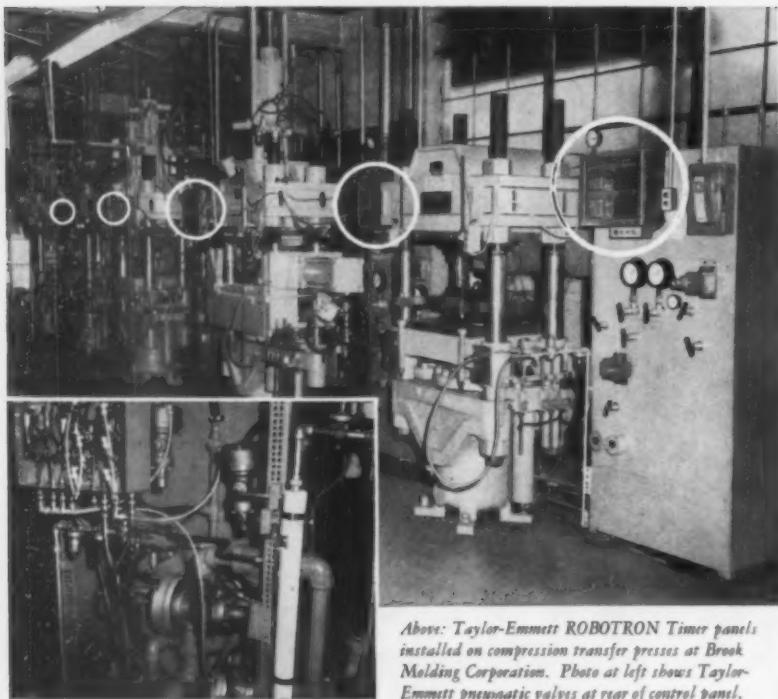
PEERLESS ROLL LEAF COMPANY

DIVISION OF HOWE SOUND CO.

4511 New York Ave. • Union City, N. J.

BRANCH OFFICES: BOSTON • CHICAGO • Peerless Roll Leaf Division • GANE BROS. & LANE, INC.

REPRESENTATIVES: ST. LOUIS • LOS ANGELES • SAN FRANCISCO • LOUISVILLE • MONTREAL • LONDON, ENG.



Above: Taylor-Emmett ROBOTRON Timer panels installed on compression transfer presses at Brook Molding Corporation. Photo at left shows Taylor-Emmett pneumatic valves at rear of control panel.

"TAYLOR-EMMETT Valves and ROBOTRON* Timers give us uniform performance cycle after cycle!"

"Through their use", says Mr. F. Reed Estabrook, Jr., President of Brook Molding Corporation, Norwood, Mass., "we get instantaneous control over time, distance, speed and pressure,—variables which determine the success or failure of a production molding cycle."

Brook Molding produces camera and projector parts, components for electrical switch-gear, missile parts, electronic equipment and timing devices, processing equipment parts. To make such a wide variety of shapes and sizes of product, in all types of materials, requires extremely rapid changing of molding cycles for efficient operation. "Our Taylor-Emmett valves and timers permit resetting to new molding cycles in a matter of seconds. Compression presses do double duty as transfer presses—a versatility due in large part to these Taylor-Emmett instruments", adds Mr. Estabrook.

Taylor-Emmett valves and timers are sold and serviced by Taylor Instrument Companies. See your Taylor Field Engineer, or write Taylor-Emmett Controls, Inc., Akron, Ohio, or Taylor Instrument Companies, Rochester, New York and Toronto, Ontario.

*Trade-Mark

Taylor-Emmett Controls, Inc.
A SUBSIDIARY OF *Taylor Instrument Companies*

THE PLASTISCOPE

(From page 232)

or its anhydride may be important as an epoxy curing agent, according to the company.

Flame-resistant coatings

The high heat resistance requirements of missile components has led to the development of a new coating material for plastics that might have broad commercial applications in the future. Dyna-Therm Chemical Corp., Culver City, Calif., has introduced a coating, designated D-65 which will withstand the direct flame from an acetylene torch—4000° F.—for approximately 1 min. per 50 mil of dry coating. D-65 is described as flame-resistant and intumescent—when heat is applied the coating expands and bubbles, providing an insulation for the material underneath. This coating contains phosphates and boron flameproofing chemicals dispersed in a flexible urethane binder. Swedlow Inc. of Los Angeles, Calif. and Youngstown, Ohio has been appointed exclusive sales agent for the product in the United States and Canada, and plans to use it in its own manufacturing processes for plastics and other components for the missile and aircraft industries. Potential uses for D-65 include fire barriers in commercial and private aircraft, and as a fire protectant in factories.

Albi Mfg. Co., Rockville, Conn., has formed a Plastics Applications Div. to specialize in the development and application of fire-retardant coatings in plastic components and products. The division has established separate laboratory facilities to test plastics parts and assemblies protected by fire-retardant paint.

According to B. B. Kaplan, Albi's president, by applying fire-retardant coatings in critical areas of the plastic surface, full UL approval has been attained in such diverse products as hair dryers, slide projector cases, electric mixers, computer tape reels, and built-in hi-fi systems. When coated with fire-retardant paint, the properties of plastics are not changed, the company states, and the over-all

(To page 236)



"WE DIDN'T HAVE TO BUY OUR FOURTH NRC VACUUM COATER

Thanks to the new NRC Mechanically Refrigerated Cold Trap"

... says *Jack Selsmeyer*
Production Manager, Kent Plastic Corporation
Evansville, Indiana

"In the spring of 1957 we decided to buy our fourth NRC vacuum coater. With the increased demand for our vacuum metallized plastic medallions and nameplates, that was the only way we knew of getting through the dread summer months without sacrificing the top quality and prompt delivery on which we've built our business. Summer's always been tough because the high humidity has caused our metallizing cycles to triple and our reject rates to rise.

"We'd already placed the order for the fourth coater, when NRC engineers introduced us to the new mechanically refrigerated cold trap. At first we were skeptical, because we knew other attempts to solve the humidity problems with cold traps had proven expensive and ineffective. However, the ability of the NRC mechanical refrigerator to

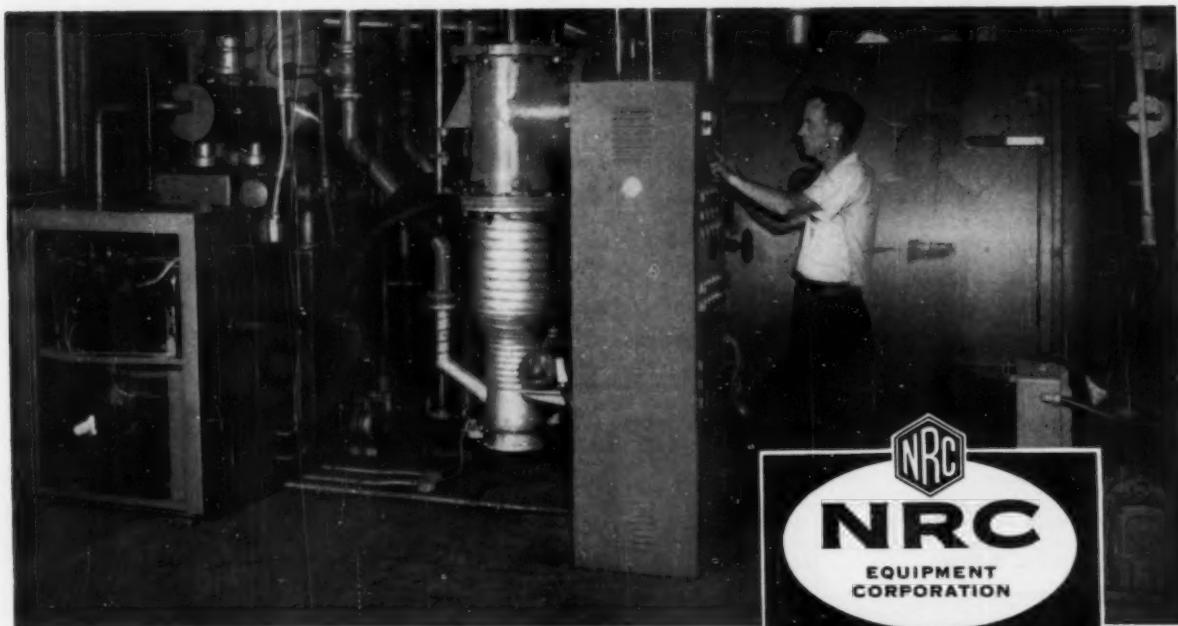
maintain the cold trap at -150°F , and the special design features of the latter made us decide to try it on one coater.

"Results were spectacular. Production rates and rejects were almost independent of humidity, so that our hot weather costs are way down and we've got a competitive advantage in being able to make good on deliveries. Unfortunately for NRC, after we installed similar systems on our other two coaters we had so much more usable summer capacity that we didn't need the fourth coater."

The NRC Mechanically Refrigerated Cold Trap Assembly consists of a special refrigerator and one or more copper coils flange mounted for positioning directly above each diffusion pump. It offsets high humidity by freezing out water vapors

before they can add to the load on the diffusion pumps. The assembly is easily installed in coaters equipped with NRC pumping systems and is simply modified for other equipment. The standard 4 HP refrigerator will maintain two traps at -150°F , the temperature found most effective for coaters operating at the usual 0.5 microns pressure. More powerful refrigerators are available for coaters operating at lower pressures or equipped with more than two diffusion pumps.

This development is the latest of the many contributions which NRC has made to profitable metallizing. If you now operate or are considering the purchase of a vacuum coater, it will pay you to ask your nearest NRC sales engineer for full details on how you profit from these contributions. Write or phone today.



SALES OFFICES: Atlanta • Boston • Chicago • Cleveland • Houston
Los Angeles • New York • Palo Alto • Pittsburgh

NRC EQUIPMENT CORPORATION
Newton 61, Massachusetts
Dept. MP-3, 160 Charlemont Street

NEW Foolproof Method of Sweeping Molds

BERMER-BILT Automatic MOLD WIPER

For Injection Machines using Automatic or Semi-Automatic Molds. Synchronizes with machine cycle. Adaptable to all Injection Molding Machines.

- Sweeps clean • Instantaneously
- Sweeps Safely • Automatically

This Bermer-Bilt Automatic Die Wiper or Sweep provides the most efficient, economical method for stripping molds of ejected parts, sprues and runners. Ejector pins, sleeves and stripper plates are combed clean. It is equipped with a safety device which prevents the mold from closing on the blade.

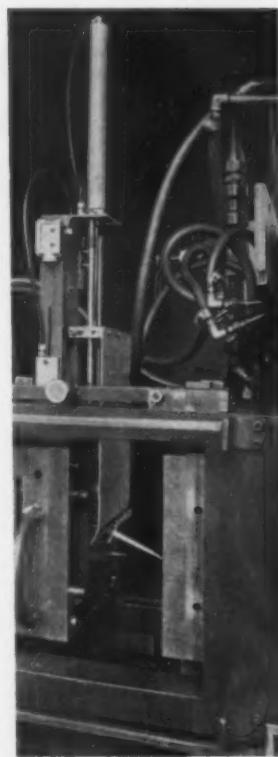
Get more complete information on how this advanced Automatic Wiper can speed up your plastic molding production, insure mold safety, show greater return on production.

Dept. MP-1

Bermer Tool & Die, Inc.

Southbridge

Massachusetts



THE PLASTISCOPE

(From page 234)

cost is lower than when flame-resistant additives are used in the molding compound.

Reinforced plastics

Panel progress. An outdoor canopy made entirely of glass reinforced polyester is now being marketed by the Tru-Scale Div., Wasco Chemical Co., Wichita, Kan. The prefabricated unit consists of RP arches supporting 0.08-in. sheeting of the same material. The beams are hand-molded, and each of the supports consists of three hollow sections which are telescoped at the job site to make a complete span. The skin for the canopy is produced by a continuous lamination in strips measuring 2 by 42 feet. The structure has a length and width of 30 ft., and a height of 20 feet. The length can be adjusted by adding or eliminating beams. According to the company, labor costs are minimized because of the structure's simplicity of design and construction, and 3 unskilled workers can assemble the lightweight components and erect a canopy in less than five days.

The unit was developed by Tru-Scale in cooperation with Monsanto Chemical Co. The beams are made of glass matting used in combination with Pittsburgh Plate Glass Co.'s polyester resin trademarked Selectron 5119. The skin panels are made with 1026-Z resin supplied by Interchemical Corp., Finishes Div., Cincinnati, Ohio.

Two of the structures are now in use at Baton Rouge, La., where, erected side by side, they span the driveway and pumps of a service station. At night, concealed base lights make the translucent polyester surfaces glow. When assembled and riveted in place, the canopy is said to be sturdy enough to withstand 80 m.p.h. winds.

A decorative RP panel featuring a random pattern of multi-colored leaves, butterflies, and gold flecks against a frost background is now available from Filon Plastics Corp., Hawthorne, Calif., at a retail price (To page 238)

KESSLER

FATTY AND DIBASIC ACID ESTERS OF MONOHYDRIC & POLYHYDRIC ALCOHOLS

A Check List

of widely used plastics, with the appropriate Kessler plasticizers for each, is offered below, as an indication of Kessler's comprehensive coverage of this ever-growing industry.

FOR	USE
POLYVINYL CHLORIDE	KESSCOFLEX - DOA - DDA - DOZ - BCP - BCO
POLYVINYL ACETATE	KESSCOFLEX - MCP - BCP - TRA - DIA - DBT
POLYVINYL BUTYRAL	KESSCOFLEX - BCA - BCP - MCP - TRA
CELLOULOSE ACETATE	KESSCOFLEX - MCP - TRA - DIA - DBT - MCA
CELLOULOSE ACETATE BUTYRATE	KESSCOFLEX - DOA - DDA - MCP - BCP - BCA
NITROCELLULOSE	KESSCOFLEX - DOA - DDA - BCP - TRA - DBT
ETHYL CELLULOSE	KESSCOFLEX - BCA - DOA - DDA - BCP - MCP - BS - BO
POLYSTYRENE	KESSCOFLEX - BS - BCS - X334
ACRYLICS	KESSCOFLEX - BCA - MCP - BCP - TRA - DBT
SYNTHETIC RUBBERS	KESSCOFLEX - BO - BS - BCL - BCO - MCO - DOA - DDA - DOZ - BCP - BCS - MCP

Write, call or telephone

ESTERS FOR INDUSTRY

Let us know your specific needs

KESSLER CHEMICAL CO., Inc. 7298 State Rd. Philadelphia 35 Pa.

SINCE 1921

THORESON-MCCOSH, INC.

SERVING THE PLASTICS INDUSTRY



HOPPER DRYER and new combination JET HOPPER LOADER increases your production . . . soon pays for itself in savings to you!

Dries and preheats material at less cost than with conventional drying ovens.

Easy installation in a matter of minutes on any standard machine.

More production because of properly controlled conditioning of material.

Less material handling, with increased hopper capacity, no oven handling.

New Jet Loader maintains preheated condition of material. No compressed air.

For complete information write today. THORESON-MCCOSH, Inc., 18208 W. McNichols, Detroit 19, Michigan, KEnwood 1-4700



ALLEN HEAVY DUTY PUNCH PRESSES

POWERFUL • DEPENDABLE
ECONOMICAL
FULLY GUARANTEED
MODERATE IN PRICE

Hundreds of different
Model Combinations
1 to 12 ton Capacities

See your Supply Dealer
or write for Catalog giving
complete information,
specifications and
prices on our line of
Heavy Duty Punch
Presses.

Thousands In Use
the World Over

Model BT-5
5 Ton
\$395.50
less motor
\$60



Model BT-12
Special Duty
1 Ton-\$365.00
less motor-\$60



Model BT-2 2-Ton
\$37.50
less motor-\$60

ALVA ALLEN INDUSTRIES, Dept. MP
Clinton, Missouri
Tel. TURNER 5-3331

NEW! Vertical Injection Molding Machine Compact - Swift - Safe



Mercury by PROGRESSIVE

CHANGE MOLD AND CYLINDER IN MINUTES!

New way to profitable insertion contact and plug molding. Available in 1 oz. and 2 oz. capacities per plastic shot with exclusive sliding table giving operator more freedom of movement in positioning inserts. Full push button control. No levers. Less operator fatigue, more production.

Table moves swiftly in and out between platens. Production, 600 cycles per hour. Highest mold accuracy. Occupies absolute minimum of floor space. No operator risks.

Mold sets for these units cost approximately half conventional sets. Profitable on long or short runs.

Complete details and brochure on request.



530-17 Boston Turnpike
Shrewsbury, Massachusetts

363-9

**"Our BIPEL
Preform Rate
jumped from
1900 to 3300
per hour!"**



The General Industries Company, Elyria, Ohio, reports:
"We required 2½" dia., .150 lb. preforms, from agitator-type materials. With BIPEL, we're now producing 3300 per hour... with total weight variations about 1%... as against 1900 per hour available previously. We're awaiting our second BIPEL."

And so another leading manufacturer offers praise for BIPEL Preformers, the new pacesetters of the industry. The improvements responsible for this production increase are now standard. This allows faster, more accurate preforming of any materials up to agitator-type; even higher impact materials, with special feeders.

Are you getting maximum production of your preforms? Send us your special requirements.

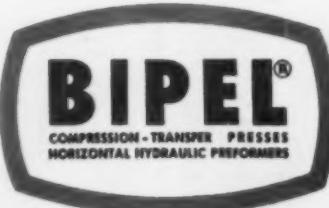


Demonstrations and Services at Tiverton



B. I. P. ENGINEERING LTD. Sutton Coldfield, England
JOHN SPERLING & CO., 739 Mountain St., Montreal 3, Que.

RALPH B. SYMONS ASSOCIATES
3571 MAIN RD., TIVERTON, R. I.



THE PLASTISCOPE

(From page 236)

of 69¢/sq. ft. Specifically designed for interior applications, such as room dividers, shoji screens, table tops, and luminous ceilings, the panel measures 48 by 144 inches.

William Graubard, 783 Clara Dr., Palo Alto, Calif., supplies custom-designed panels in 50 transparent and opaque colors, which are said to be lightfast.

American Polyglas Corp., Carlstadt, N. J., completed an order for 44,000 sq. ft. of opaque RP paneling for use in atomic submarines of the U. S. Navy. The material was supplied to the Electric Boat Div. of General Dynamics Corp., but Polyglas is producing a commercial variation of these panels for exterior and interior partitions, windows and skylights, and for use in automotive vehicles.

Honeycomb core. Six different honeycomb core materials consisting of woven glass cloth impregnated with a phenolic resin and separately applied phenolic dip coats, have been developed by Hexcel Products Inc., Berkeley, Calif. Called HRP, the materials range in density from 2 lb. to 15 lb./cu.ft. in cell sizes of $\frac{1}{8}$ and $\frac{1}{16}$ inches. The lower densities are designed for use in highly loaded aircraft and missile components, the middle densities for primary aircraft structures, and the higher densities for marine structures such as hydrofoils and under-water containers. Hexcel has removed CTL core, an earlier version of heat resistant plastics honeycomb, from its product line.

High strength sheet. Production of RP sheet said to have a unidirectional flexural strength of 250,000 p.s.i. has been started by The Parallite Mfg. Co. at a new factory in Export, Pa. The company produces its own glass fibers and produces a finished mat from which flat sheet laminates are made. The new material is expected to find applications as electrical grade laminates and tubes for the electrical industry; missile motor cases; pipe production; in truck and railroad car components; in high pressure contain-

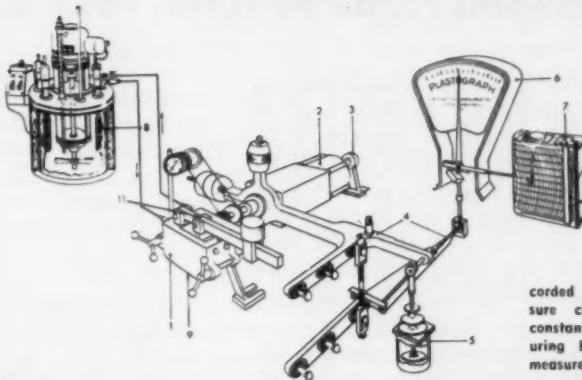
ers; and for aircraft and missile structures. According to the company, the material has good dielectric strength, can be machined and colored.

Impact molding compound. Electrical insulating parts are now being made from Resistrac, a new fibrous glass alumina-polyester impact molding compound developed by The Glastic Corp., Cleveland, Ohio. According to the company, parts molded of this new material resist the formation of carbon tracks when operating under voltage stresses in extreme conditions of humidity and contamination. When subjected to the salt-fog test molded parts of Resistrac reportedly have a tracking resistance at least 25 times that of conventional glass polyester. They do not exhibit the spalling common to ceramic-type materials that have suffered thermal shock caused by arcing, the company reports. The molding compound is also flame resistant.

For printed circuits. A glass-reinforced epoxy, copper-clad laminate, designated Textolite 11585, has been introduced by General Electric Co. for flush printed circuits. The new grade is classified NEMA G-10, and is available in sheets measuring 36 by 48 in., 36 by 36, and 36 by 72 inches.

National Vulcanized Fibre Co., Wilmington, Del., has introduced a paper-base phenolic laminate which is said to provide flame retardance with good cold punching characteristics at nearly half the cost of epoxy-paper laminates. Designated Phenolite Grade XXXPC-476, the base stock meets the electrical, physical, and mechanical requirements of NEMA standards and Underwriters' Laboratories test for flame resistance, the company states. It is also available as a foil copper-clad laminate with standard adhesive bonding made primarily for commercial radio and TV applications, and as a copper-clad laminate intended primarily for electronic computer printed circuits and military applications requiring plating from alkali solutions. Phenolite EP-491, an epoxy paper grade, costs \$1.55/sq. ft. in $\frac{1}{16}$ -in. thick. (To page 241)

The "Inside Story", or . . . "How the C.W.B. Plastograph Solves the Processing Problems"

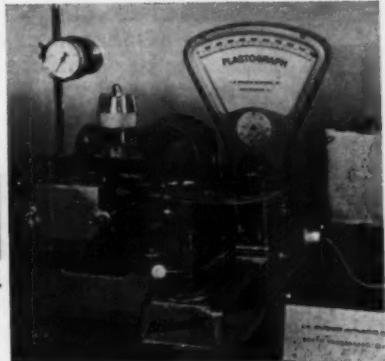


Sample in jacketed mixer-measuring head (1) driven by variable speed motor (2) mounted on floating bearings (3). Reaction torque transferred to balanced lever arm system (4) movements of which are damped (5), registered visually on indicator (6) and recorded on chart (7). Oil pressure circulator (8) maintains constant temperature in measuring head. Stock temperature measured (9).

Accurately forecasts processability before production begins. Records plastic flow of all polymers and measures as no other flow tester can under typical processing conditions. See for yourself! Write for reprints of published applications.



SOUTH HACKENSACK, N. J.
52 E. Wesley St., Diamond 3-8425



NOW patented

U.S. Patent 2,875,312
and other patent pending.

THERMEL
THERMASTRIP
BANDS

(TYPE B)
For any cylindrical shapes
such as cylinders,
dies and piping.



Construction Features

- Incoloy Tubular Elements (Thermotube®)
- Aluminum Contact Shoes
- Low Expansion Stainless Steel Strapping Band
- Vitreous Enamelled Outlet Boxes (optional)

CHECK THESE ADVANTAGES

- ✓ Full Circle Heating — No Cold Spots.
- ✓ Positive Pressure — expansion contact of aluminum shoes.
- ✓ Rapid Assembly — installation of band or any part in seconds on HOT CYLINDERS.
- ✓ Individual or Gang Outlet Boxes — (optional).
- ✓ Exceptionally long-life Tubular Elements — even at 440 volts.
- ✓ Complete Interchangeability — of individual component parts.
- ✓ Semi-Flexible — adaptable to $\frac{1}{4}$ " variation in cylinder diameter.
- ✓ Available 1 $\frac{1}{2}$ " or 2 $\frac{1}{2}$ " widths.
- ✓ Diameters 4" to 12" I.D. standard.
- ✓ Shoes made in Quadrants over 12" I.D.

Write for details — ONE WEEK DELIVERIES NOW BEING MADE

Thermel, Inc.

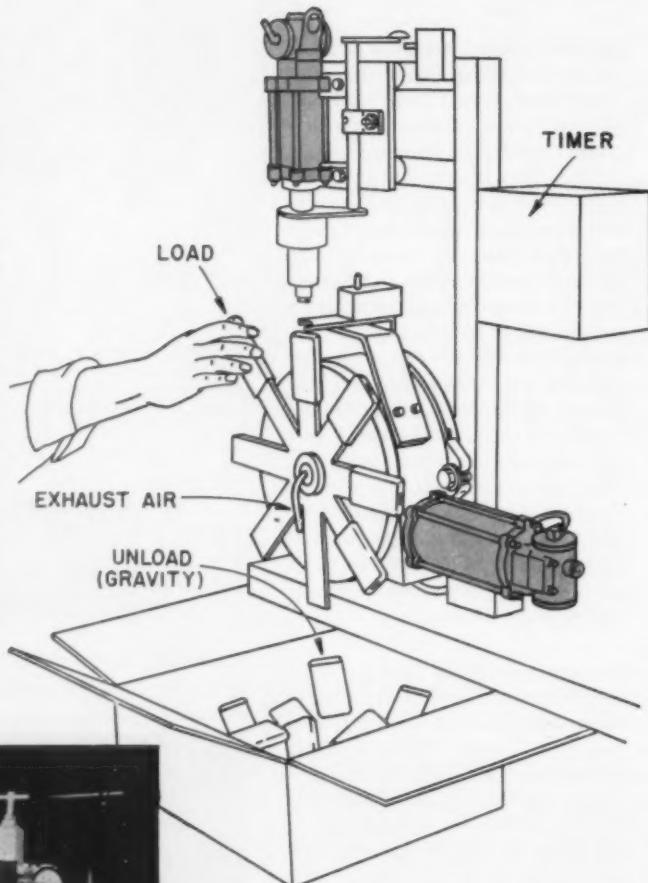
9410 Robinson Rd., Franklin Park, Ill.
A Suburb of Chicago

THIS SIMPLE SHOP-BUILT "FERRIS-WHEEL" CAN BE USED TO PUNCH, STAMP, HEAT-SEAL . . . OR TO FLARE, FORM OR RIVET

It's another example how versatile Bellows "Controlled-Air-Power" Devices can be used to "spot-automate" operations in almost any industry. This "SPOT-A-MATION IDEA" is based on a setup used by Frank Steere Enterprises to cut a slot in a plastic key case. But the basic idea can be adapted to perform a host of operations in wood, leather, light metals, or plastics.

It's a simple, inexpensive device. A Bellows Rotary Feed Table, mounted vertically, feeds the part to the tool attached to the piston rod of the Bellows Air Motor. The two are electrically interlocked. Bellows Rotary Feed Tables can be provided to index almost any number of positions. The unit can be equipped with a "timed dwell"; additional work stations can be set up to perform other operations on the same part; automatic feeding or ejecting devices could be installed.

Whatever you make, however you make it, Bellows "Controlled-Air-Power" Devices can help you make it at lower cost.



In this application a heated Slotting Tool is used, hence the Bellows BT-1 Timer to control the length of time the tool is in contact with the plastic part. The exhaust air from the Rotary Feed Table is used to give an assist in unloading the part.

THIS SPOT-A-MATION IDEA FILE IS YOURS ON REQUEST



Complete wiring diagrams, installation data and equipment list on the "ferris-wheel" shown, and on a score of other applications where Bellows air-powered work units are used to convert existing equipment to lower cost operation. Write for it today. Address: Dept. MP-660, Bellows-Valvair, Akron 9, Ohio.

13148-3

Bellows-Valvair

The Bellows Co. • Valvair Corp. Akron 9, Ohio
DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

THE PLASTISCOPE

(From page 239)

ness with 1-oz. copper on one side, while the new material sells for \$0.96 in the same thickness. The new laminate is furnished in sheet sizes of 39 by 39 in., and 39 by 47 inches. Available thicknesses range from $\frac{1}{2}$ to $\frac{1}{4}$ -inch.

New catalyst. A methyl ethyl ketone peroxide catalyst, for the reinforced plastics industry called Hi Point 180, has been developed by U. S. Peroxygen Corp., Richmond, Calif. According to the company, this catalyst is safer than previous formulations, since it has a minimum flash point of 180° F. but the same curing characteristics of other MEK peroxides made by U. S. Peroxygen.

RP angles. Plastic Age Sales Inc., Saugus, Calif., produces angular shapes from combinations of polyester resin and fibrous glass mat. Where slightly more strength is required, fibrous glass cloth is

used. Tensile strength up to 58,000 p.s.i., compression strength to 90,000 p.s.i., and flexural strength to 100,000 p.s.i., reportedly can be obtained with these RP materials. The angles come in 14½-ft. lengths in 73 different leg sizes.

The Glastic Corp., Cleveland, Ohio, now supplies 10 different structural insulating shapes made from fibrous glass reinforced polyester stock in widths ranging from $2\frac{1}{8}$ in. to $9\frac{1}{2}$ in., and lengths from 28% to 75% inches. The stock may be cut into angles or channels and is engineered for use in equipment operating at Class B temperatures (130° C.), and is said to meet NEMA GPO-1 specifications and is reported to be flame retardant.

Boat order. Lunn Laminates Inc., Huntington Station, Long Island, N. Y., has received a contract for construction of 23 26-ft. reinforced plastic personnel boats which will replace the slower 28-ft. wooden boats currently being used by the Navy. The boats are scheduled for assignment aboard

guided missile destroyers and guided missile frigates. They will be powered by a 225 hp. Diesel engine and are expected to do 21.5 knots with 14 men and a 2-man crew. The boats include a completely enclosed cabin; the deck and interior are in one piece with 2-tone molded-in color.

Large hoods. A combination hood-and-duct measuring 46 ft., and designed for service in a nickel processing plant, was recently supplied by The Ceilcote Co., Cleveland, Ohio. The ventilating hood is equipped with an internal washout spray pipe and each hood has an individual adjustable damper to control velocity. The units were fabricated in three sections to provide savings in mold and construction costs. Internal baffles and thick wall members make the unit rigid and self-supporting.

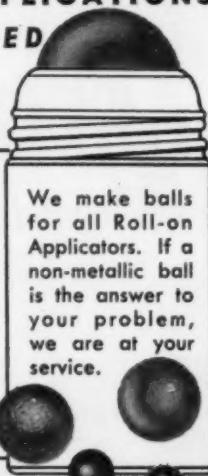
Large Navy order. Two contracts with the Navy exceeding \$1 million for making fibrous glass torpedo launcher tubes and launcher assemblies (To page 243)

BALLS UNLIMITED FOR UNLIMITED APPLICATIONS IN FIELDS UNLIMITED

ACRYLICS, CELLULOSICS, POLYSTYRENE,
POLYETHYLENE, NYLONS, TEFON®,
LEXAN®, WOOD, STYROFOAM®.

NON METALLIC BALLS are used for a great variety of things such as check valves, ball bearings, rollers, detents, etc., as well as many uses in the chemical field. If you have a need, we are equipped to make balls from 1/16" dia. up to 1" dia. in quantity. Samples of many sizes in a range of materials are available.

We can also supply small turnings of cylindrical shapes formed from round rods and tubes for all types of applications. Range of sizes is from $\frac{1}{8}$ " to 1" diameter and up to 7" long. We hold tolerances of .002 on plastic and .005 on wood, plus or minus.



If a plastic ball will make it better...
ORANGE can make it best!

PLASTIC BALL DIVISION

ORANGE PRODUCTS, INC.

554 MITCHELL ST., ORANGE, NEW JERSEY

WRINKLE- FREE CONTINUOUS-ROLL OPERATION

KAY

ANTI-WRINKLE
SLAT
EXPANDER

By guarding your processing line against wrinkling, the Kay Slat Expander:

1. Allows faster, more efficient machine operation
2. Reduces losses through rejection
3. Assures tighter, neater rolls
4. Assures higher-quality printing and closer register

Supplied with wooden slats for use at room temp. and aluminum for use in ovens, to 550°.



KAY MACHINE COMPANY INC.
Expanders and Rollers

136 Paterson Avenue, E. Rutherford, New Jersey • WEBster 3-4641
EXPORT OFFICE: 401 Broadway, New York 13, N. Y.
MIDWEST REP.: C. J. Beringer Co., 5667 Milwaukee Ave., Chicago, Ill., SPRing 5-3333



View of helicopter engine assembly shows position of contravane (arrow). In this location, the part is subjected to constant engine vibration. At right is an epoxy-glass fiber contravane, in excellent condition after 15 million cycles. It is produced for Sikorsky Aircraft, a division of United Aircraft Corporation by Hampden Brass and Aluminum Company, Fibermold Division.

GLASS-REINFORCED "BAKELITE" EPOXY RESINS

Give over 5 times longer service life to vital helicopter part

During service, the cooling air deflectors mounted directly on the engine of Sikorsky S-58 helicopters are subjected to constant engine vibration. These contravanes, traditionally made of metal, suffered extensive fatigue cracking after about 3 million cycles when operated at their resonant frequency in a test machine.

Now, contravanes made of glass fiber laminated with BAKELITE epoxy resin are being used. Why was this epoxy-glass combination selected? Because of exceptional vibration damping and fatigue resistance. Fatigue tests—like those made on the metal contravanes—showed no sign of failure at 15 million cycles. And

as a bonus, the epoxy-glass part gives an 11½ per cent saving in weight.

This important new use for high-strength reinforced epoxy resin points up its outstanding potential as a structural material. For further information on BAKELITE epoxies write Dept. BM-87, Union Carbide Plastics Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



THE PLASTISCOPE

(From page 241)

have been announced by Apex Fibre-Glass Products, division of White Sewing Machine Corp. About 600 of the tubes and 20 complete launcher assemblies will be manufactured by Apex, using a centrifugal molding process which is said to provide straight tubing of uniform diameter and wall thickness.

Colored bathtubs. The new permanent mobile homes manufactured by Windsor Mobile Homes, Bristol, Ind., are now equipped with fibrous glass bathtubs, 46½ in. long and weighing 18 pounds. They are manufactured by Sani-Glas Inc., Amsterdam, N. Y., with mold-in colors. They are priced competitively with steel bathtubs but cost less than cast iron tubs.

Replaces metal. One of the largest reinforced plastics cylinders ever made has been produced by Zenith Plastics Co., Gardena, Calif.,

a subsidiary of Minnesota Mining & Mfg. Co. More than 25 ft. long, with a 57-in. inside diameter, the cylinder was fabricated of 3M's Scotchply brand RP material for Lockheed Missiles & Space Div., replacing a metal cylinder.

Weight of the missile cylinder is 1000 lb., a sharp reduction from the metal weight. According to the company, the large reinforced plastics unit can be made on a production basis.

New Companies

Dayton Dayflex Plastics Co., Dayton, Ohio, is a newly-organized division of **Dayco Corp.**, and will be engaged in manufacturing and sales operations of a line of plastic hose for vacuum cleaners, hair dryers, swimming pools, vents, and exhausts. **S. K. Lamden** is manager of the new division.

Expansion

Illinois Tool Works is building a 73,000-sq.-ft. plant at Des Plaines, Ill. to house the newly-formed

Conex Div., which will manufacture thin-wall plastics containers and other packaging products. The new facilities, scheduled to be ready for occupancy early this fall, are expected to employ 150 persons initially. Production is scheduled to start soon on a plastics carrier for canned beer and other beverages. **Walter J. Simons**, formerly with Continental Can Co., was named general manager of the division.

Union Carbide Chemicals Co. is now operating its new Technical Service Laboratory in Tarrytown, N. Y. This new facility centralizes and expands the company's customer service and use-research that had been carried out principally at Mellon Institute in Pittsburgh, Pa., and also in several other areas including South Charleston, W. Va.; Whiting, Ind.; and affiliated company laboratories at Bound Brook, N. J.; Tonawanda, N. Y.; and Millwood, N. Y. The laboratory building accommodates about 100 scientists with an administrative (To page 244)

COMPOUNDS

for
EXTRUSION
AND
MOLDING

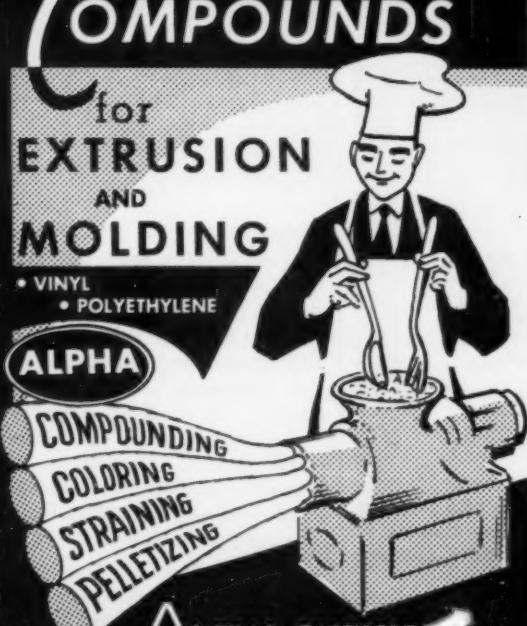
- VINYL
- POLYETHYLENE

ALPHA

COMPOUNDING
COLORING
STRAINING
PELLETIZING

ALPHA CHEMICAL & PLASTICS CORP.

11 JABEZ STREET, NEWARK 5, N. J.
TEL. MARKET 4-4884



TONOX
EPOXY CURING AGENT

for encapsulating
electrical components



gives LONG POT LIFE

- minimum vapor hazard and skin staining
- low cost
- high strength
- high heat distortion point
- high moisture resistance

Write for information

Naugatuck Chemical

Division of United States Rubber Company
615X Elm Street, Naugatuck, Connecticut



Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latex
CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmvale, Ontario • CABLE: Rubberport, N. Y.

New...

PRO-VAC for low cost thermoforming production with Auto-Vac quality.



\$2,995.00
Basic machine
F.O.B. Bridgeport, Conn.

PRO-VAC

Combination drape and vacuum forming machines offer ample (24" x 30") forming area, rugged construction and versatility at low cost. Ideal for product or package forming, prototype production or material testing.

Pneumatic, adjustable speed, drape-up table accommodates molds to 8" high. Heating and forming automatically controlled by time clock. Clamping frames are adjustable for any forming area from 12" x 12" to 24" x 30", and for material up to 250 mils thick. Oversize radiant type heater provides extra fast heating cycle and prevents cool edges. Complete production changeover may be made in one-half hour.

For semi- or completely automatic operation, timer-controlled cooling and air blow-off are available at extra cost.

Plug forming attachments for deep draw forming and roll feed attachments are offered as accessory equipment.

FOR COMPLETE INFORMATION WRITE OR CALL



AUTO-VAC Company
A DIVISION OF NATIONAL CLEVELAND CORPORATION
1991 State Street Ext., Bridgeport, Connecticut EDison 4-9481

THE PLASTISCOPE

(From page 243)

staff of 50 people under the direction of **Dr. A. B. Steele**. The main portion is 300 ft. long and 60 ft. wide. About one-third of the building is devoted to administrative offices and public areas. The remainder is divided into 46 industry-classified laboratories with 33 adjacent offices. A mechanical test building is connected to the main laboratory. Among major industry groups in which work is under way at the new facility are plasticizers, polyether foams, and surface coatings.

Formica Corp., subsidiary of **American Cyanamid Co.**, added 32,000 sq. ft. to its Evendale, Ohio plant to house a new plastics laminating press. The press weighs 300 tons, stands 26 ft. high, has a 7000-ton clamping pressure capacity, and can produce laminated sheets up to 5 ft. by 12 ft., pressing 160 sheets at a time. According to the company, the new installation can produce 172,000 sq. ft. per day, or approximately 51,840,000 sq. ft. annually.

Sloan Mfg. Co., Sun Valley, Calif., opened a 14,000-sq.-ft. warehouse and office building at 1401 Fairfax Trafficway, Kansas City, Kan., which will serve as distribution headquarters for an area from Colorado to the East Coast, and from Mexico to Canada, for the company's plastics pipe.

Monsanto Overseas S. A., through its wholly owned subsidiary, **Monsanto Argentina S.A.I.C.**, has started production of PVC compounds, phthalic anhydride, and DOP plasticizer in Zarate, Argentina. **Monsanto Andes S. A. I. C.**, another Argentine subsidiary, owned in partnership with **Carbometal S.A.I.C.**, Argentina, has opened a new plant for the production of vinyl chloride monomer and PVC resin.

Bendix Aviation Corp., Kansas City Div., has completed a polymer chemistry and engineering building. The new facility provides for the synthesis of polymeric and resinous materials to meet speci-

(To page 246)



Remarkable present . . . amazing future!

Flexible urethane foams alone are sure to pass the 100-million-pound mark in 1960. And they are only a part of the story. What limits can you place on materials that cut 8½ tons from an atomic submarine's weight; protect missile components against heat damage to 6000° F.; are preferred by jet aircraft and automobile manufacturers for insulation and cushioning; make foam mattresses as economical as innersprings; promise 20-year house paints and 100,000-mile-tread automobile tires?

Jefferson offers new polyethers made to rigid urethane specifications with emphasis on low unsaturation, low water content, low ash, low acid numbers, and controlled pH. Also available are excellent catalysts for flexible, semi-rigid and rigid urethane foams . . . N-methylmorpholine, N-ethylmorpholine, and the interesting amine, N, N'-dimethylpiperazine. For a partner in developing better urethane products, contact . . . Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.



Ethylene and Propylene Oxides, Glycols, Dichlorides, Carbonates
 SURFONIC® Surface-Active Agents • Ethanolamines • Morpholine
 N-Alkyl Morpholines • Polyethylene and Polypropylene Glycols
 Piperazine • Piperazine Salts • Nonyl Phenol • Caustic Soda
 HOUSTON • NEW YORK • CHICAGO • CLEVELAND • CHARLOTTE • LOS ANGELES

**JEFFERSON
CHEMICALS**

available at Hyde

delrin®



Molded Parts— Rods and Slabs For Prompt Delivery!

A. L. Hyde Co., a pioneer in plastics injection molding since 1932 offers for prompt delivery

- Injection molded Delrin rod stocks in diameters up to 5".
- Slab stocks in sizes up to 12" by 12".
- A complete custom injection molding service to meet your requirements—with injection presses ranging from 4 to 200 ounces

A. L. Hyde Co.

Write for complete literature
Dept. P-3, GRENLOCH, NEW JERSEY
DISTRIBUTORS FROM COAST TO COAST

Member of Plastic Pioneers



DUPONT Trademark

Here's how
**MICROLIMIT
CONTROL**



ASSURES AUTOMATIC SAVINGS ON WIRE AND CABLE PRODUCTION LINES

Weston Microlimit Control offers continuous, non-contact measurement and adjustment of wire and cable coating. Photoelectric scanning automatically regulates production variables through the control console. You save 2% or more on material costs alone, since expense of overcoating is reduced through closer tolerance control and start-up waste is cut by 50%. You can also maintain higher production speeds, and increase the quality of your product.

Model 5120 Microlimit Gauge is

mounted at extruder or die where material is measured in a highly plastic state. The unit can be used for wire and cable diameters from .075 to 3 inches. See your local representative for details on this instrument and the smaller Model 5110, or write: Weston Instruments Division, Daystrom, Inc., Newark 12, New Jersey.

International Sales Division, 100 Empire Street, Newark 12, New Jersey.

In Canada: Daystrom Ltd., 840 Caledonia Rd., Toronto 19, Ont.

DAYSTROM, INCORPORATED
WESTON INSTRUMENTS DIVISION

THE PLASTISCOPE

(From page 244)

ifications required by the Atomic Energy Commission design agencies. The plastics materials are utilized in molding compounds, adhesives, casting, encapsulating and potting compounds, foams, and laminates. Basic studies will also be made into the chemistry of plastics, the company states.

Planet Plating Co. Inc. has moved its plant and offices from Morgan Ave. to 1333 Flushing Ave., Brooklyn, N. Y. The new 15,000-sq.-ft. facility will be devoted exclusively to barrel electro-plating of plastics for the costume jewelry and novelty industries.

Brittain Products Co., Cuyahoga Falls, Ohio, has completed a 7100-sq.-ft. addition to its injection molding plant which brings the firm's total floor space to more than 50,000 sq. feet. The company produces PE housewares, ranging from a 1-pt. freezer container to a 10-gal. garbage pail, and other PE injection-molded items.

Northern Plastics Corp., La Crosse, Wis. manufacturer of laminated plastics for the electrical and electronics industries, has added 6000 sq. ft. of raw material storage space to existing facilities.

Haveg Industries Inc., Wilmington, Del., has purchased **Blow-O-Matic Corp.**, Bridgeport, Conn., and will operate it as the Blow Molding Div. of Haveg in the previous address at 405 Central Ave., Bridgeport 1, Conn. Blow-O-Matic was organized in 1958 by Danish plastics engineer, **Soren Grae**, who will join the newly purchased company as manager.

Cary Chemicals Inc. has put its Flemington, N. J. plant on stream with facilities geared to provide a minimum of 50 million lb. of PVC homopolymer and copolymer resins annually, which more than triples capacity. The company has also expanded compounding facilities at its East Brunswick, N. J. plant to produce a minimum of 36 million lb. of compounds annually. New pilot plants in operation (To page 249)

RECTO

Injection • Compression •
Transfer Molding
of PLASTICS Since 1920

Plastic products are developed from
idea to completed product by RECTO

MOLDS MADE IN
OUR OWN PLANT

RECTO MOLDED PRODUCTS, INC.

Custom Molders of Plastics Since 1920

CINCINNATI 9, OHIO

MEIrose 1-6862



Print one or two color decorations, trade marks, illustrations on almost any surface — plastic, glass, metal, wood, cardboard, etc. Automatic hopper feed and conveyor take-off. No skill required to operate! 2500 pieces per hour. Prints one or more lines at the same time on a portion of, or the complete surface. Rapidly adjustable to different sizes. Special machines to order.

Send for illustrated bulletin and samples of work!



MACHINE COMPANY
14-13 118th St., College Point 56, N.Y.

OVER 40 STANDARD DECORATING & MARKING MACHINES
In America's Largest and Most Complete Selection

DECORATIVE LAMINATES

Processors

if your problem is



... as small as a closure



... as accurate as a graduated dial



... as colorful as a molded plate

Then you should know that our research laboratories have now produced and perfected many improvements for decorating Melamine and Urea products. In addition to the printed overlay, Kaumagraph offers you these plus features:

... Creative designs ... technical ... and sales service! ... you enjoy customer satisfaction ... and profit!

For Product Identification or Decoration,
since 1902 --

kaumagraph co.
Decorated Plastics Division
350 5th Ave., New York City 1 • Wilmington 99, Delaware

LAMINATING?

*Look at the
FRENCH PRESS
Last!*

Compare French Press performance with any other in the Plastics Industry. Our engineers will gladly confer with you to help meet your pressroom needs most economically.

Mail us an outline of your requirements today!



1925 Ton Press
26" Stroke
12-3/4" Openings
54" x 50" Pressing Surface

french
HYDRAULIC PRESS DIVISION
REPRESENTATIVES ACROSS THE NATION
Boston — New York — Cleveland
Chicago — Denver — Los Angeles
Akron — Buffalo — Detroit
THE FRENCH OIL MILL MACHINERY CO.
Piqua, Ohio

**F
R
E
N
C
H**

**S & K Hobbing press
Cuts Costs & Speeds Up
die cavity production . . .**

**Here's what S & K
Machines can offer you . . .**

- Accurate Depth Control to .001
- Pre-selected Pressure Control*
- Stepless Hobbing Speed Control
- Shatter-free change over from low to high pressure
- Preselected depth control*
- Models available from 100-5,000 ton capacity

*Patented

**Cold Heading Dies •
Injection Molding Dies •
Forging Dies •
Plastic & Rubber Molds •**

Sack & Kieselbach

HALLER, Incorporated

16580 Northville Road, Northville, Michigan

**THE LEADING "COMPLETE" LINE
OF HOT STAMPING EQUIPMENT**

**Ask for
Bulletin
No. 2AH**

**Model No. 3 —
For general purpose
use (Manual)**

**Model No. 250 —
For general purpose
use (Power)**

**HIGH SPEED
AUTOMATIC
PRODUCTION**

**SINGLE OR
MULTI-COLOR**

**Exclusive
"Dwell"
Control
insures
perfect
marking**

**Standard
Feeds
include
slide chute,
dial & magazine**

**Finest Precision
engineered
design and
construction**

**Model No. 9AH —
For peripheral
marking (Automatic
& Semi-Automatic)**

**Model No. 2AH —
For high production
(Automatic)**

The Original Marking Specialists

ACROMARK

5-15 MORRELL ST., ELIZABETH 4, N. J.

**PATENTS, COPYRIGHTS AND TRADE MARKS
REGISTERED U. S. PAT. OFF., WASH., D. C.**

THE PLASTISCOPE

(From page 246)

at both facilities will permit intensified product development, the company states.

Onyx Chemical Corp. was merged with **Onyx Oil & Chemical Co.** and will be known as **Onyx Chemical Corp.** Business will be carried on under the same management and at the same locations in Jersey City, N. J. The new corporation is a supplier of acrylic resins, antistatic agents, and related raw materials.

Jayvee Brand Inc., manufacturer of diaper pants and children's rainwear, and **Plastics of America**, manufacturer of adult rainwear and industrial plastics film products, both of Portland, Ore., have combined operations and will be known as **Jayvee Mfg. Co.**, with headquarters at 1920 S. E. Grand Ave., Portland. **John G. Emery**, president of Jayvee Brand, is president and general manager of the new company. **Ron MacDonald**, former owner of Plastics of America, is vice-president in charge of production. **W. W. Van Orsdel**, formerly sales manager of Jayvee, continues in that capacity for the new company.

The Butler Mfg. Co., Kansas City, Mo., has constructed a 31,000-sq.-ft. plant in Grandview, Mo. for the production of reinforced plastics building panels.

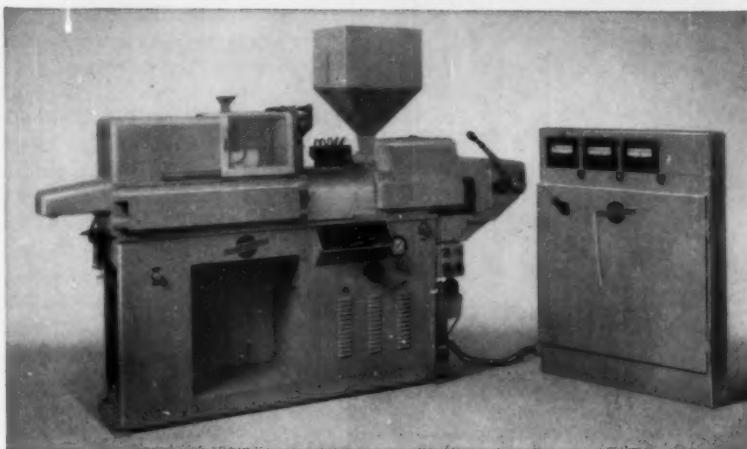
Pittsburgh Chemical Co., a subsidiary of **Pittsburgh Coke & Chemical Co.**, has dedicated its new \$4 million maleic anhydride plant at Neville Island, Pa. The new facility will have an annual capacity of 20 million lb. and is scheduled to go on stream early in 1961. The chemical is produced by the high temperature catalytic oxidation of benzene, which is a by-product of coke oven operations. The company will be self-sufficient in benzene supply.

The main use for maleic anhydride is in reinforced plastics.

Reichhold Chemicals Inc. has acquired from **Nicolet Industries Inc.**, Florham Park, (To page 250)

The AUTOMOLDER has EVERYTHING!

Big Machine Features - Fantastic Performance



The ONLY 100-Ton - Fully Hydraulic Clamp 2-oz. Machine Built

60 square inches of casting area

Has all these superior advantages-

- 2000 Cycles per Hour
- Up to 40 Pounds Plasticizing Capacity
- Special Features for Molding Nylon
- Automatic, Semi-automatic or Manual Operation
- Strong, Solid Steel-weldment Frame
- Low Maintenance Cost
- Minimum Floor Space for Maximum Production

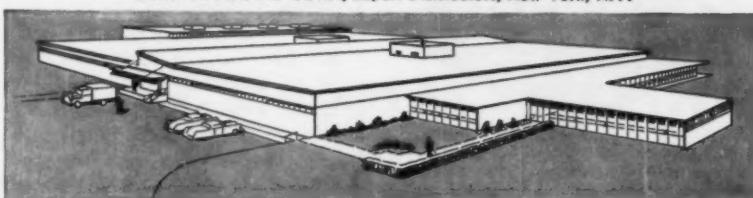
Write for your copy of illustrated folder
showing specifications on the three models of the 2-oz. Automolder.

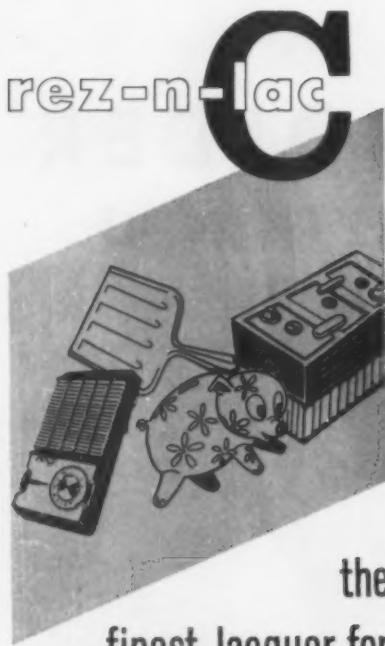
Demonstration available at our plant.

STANDARD TOOL COMPANY

213 Hamilton Street, Leominster, Massachusetts

OMNI PRODUCTS CORP., Export Distributors, New York, N.Y.





the
finest lacquer for
high impact styrene

New — from Schwartz Chemical Co., one of the most respected names in the plastics industry.

REZ-N-LAC-C was developed for fast, economical, spray application on all types of modified styrenes, acrylics and ABS resins.

Sprays on easily. Dries rapidly. Produces a smooth, tough, permanent high gloss finish. Excellent adhesion. Will withstand severest scotch tape and cross hatch scratch tests.

REZ-N-LAC-C comes in a full range of standard colors. Special colors are matched to samples at no extra cost. Available in qt., gal. and 55 gal. drums.

Samples of this newest development from Schwartz Chemical Co., are available upon request.



MANUFACTURERS OF DYES—LACQUERS—
CLEANERS—ADHESIVES— FOR PLASTICS
150-152 Classen Ave., Brooklyn, N.Y.

THE PLASTISCOPE

(From page 249)

N. J., stock of **Modiglass Fibers Inc.**, Bremen, Ohio, maker of fibrous glass. Louis J. Melillo is manager of the Bremen plant.

T. H. & J. Daniels Ltd., Stroud, Gloucestershire, England, is constructing an extension to provide an additional 15,000 sq. ft. of factory space for the manufacture of plastics molding equipment.

Burgess Pigment Co., Sandersville, Ga., producer of hydrous and anhydrous aluminum silicate pigments and kaolin clays, has doubled production capacity.

Royal Mfg. Co. Inc., an affiliate of Celanese Corp. of America, has recently acquired a 46,000-sq.-ft. plant in Hamilton township, near Trenton, N. J., for the production of blow molded containers for detergents and other products.

Ad-Pact Corp., Pardeeville, Wis. and New York, N. Y., has merged with **Pacific Ad-Pact Corp.**, San Carlos, Calif. The newly created corporation will be known as **Adpact Sign Corp.**, and will have principal offices in Pardeeville, New York City, and San Carlos. The company designs and manufactures illuminated plastics dealer identity signs.

Dynatech Plastics Inc. has started construction on a 12,000-sq.-ft. plant at Santa Ana, Calif. The company designs and produces custom injection moldings.

Ferro Corp. is building a 15,000-sq.-ft. plant at North Miami, Fla. for the production of fibrous glass mat and color gel coats. The new unit is expected to be in production by the end of this year and will be operated jointly by the Fiber Glass and Color divisions.

Hooker Chemical Corp. will start construction for a new building at the Eastern Chemical Div. plant, Niagara Falls, N. Y., to house semi-commercial production processes. Including equipment, the new facility is estimated to cost in the neighborhood of

\$1½ million. It will permit centralized production of chemicals which have outgrown the pilot plant stage, but have not yet reached commercial scale volume. The company uses an arbitrary range of \$25,000 to \$100,000 annual sales for a product as being of semi-commercial size.

Armour Alliance Industries, a division of **Armour & Co.**, has started manufacture and fabrication of flexible urethane foam in a recently constructed wing of the firm's Los Angeles, Calif., cushioning plant. The new facility has a capacity of 9000 lb. of foam per hour. Armour will continue to produce rubberized curled hair, and will supply combinations of the two cushioning materials for certain upholstering applications in addition to fabricated foam products.

Wyatt Industries Inc., Houston, Texas, has installed a 2000-ton hydraulic press with 104-in. of daylight, a 22½ kw. electronic preheater, and steam heating equipment which will be used primarily in molding large plastics insulation parts for missiles. About 600 sq. ft. of shop space had to be added to existing facilities to house the new press.

Meetings

Plastics groups

Oct. 13, 14: 16th Annual S.P.I. New England Section Conference, Wentworth-by-the-Sea, Portsmouth, N. H.

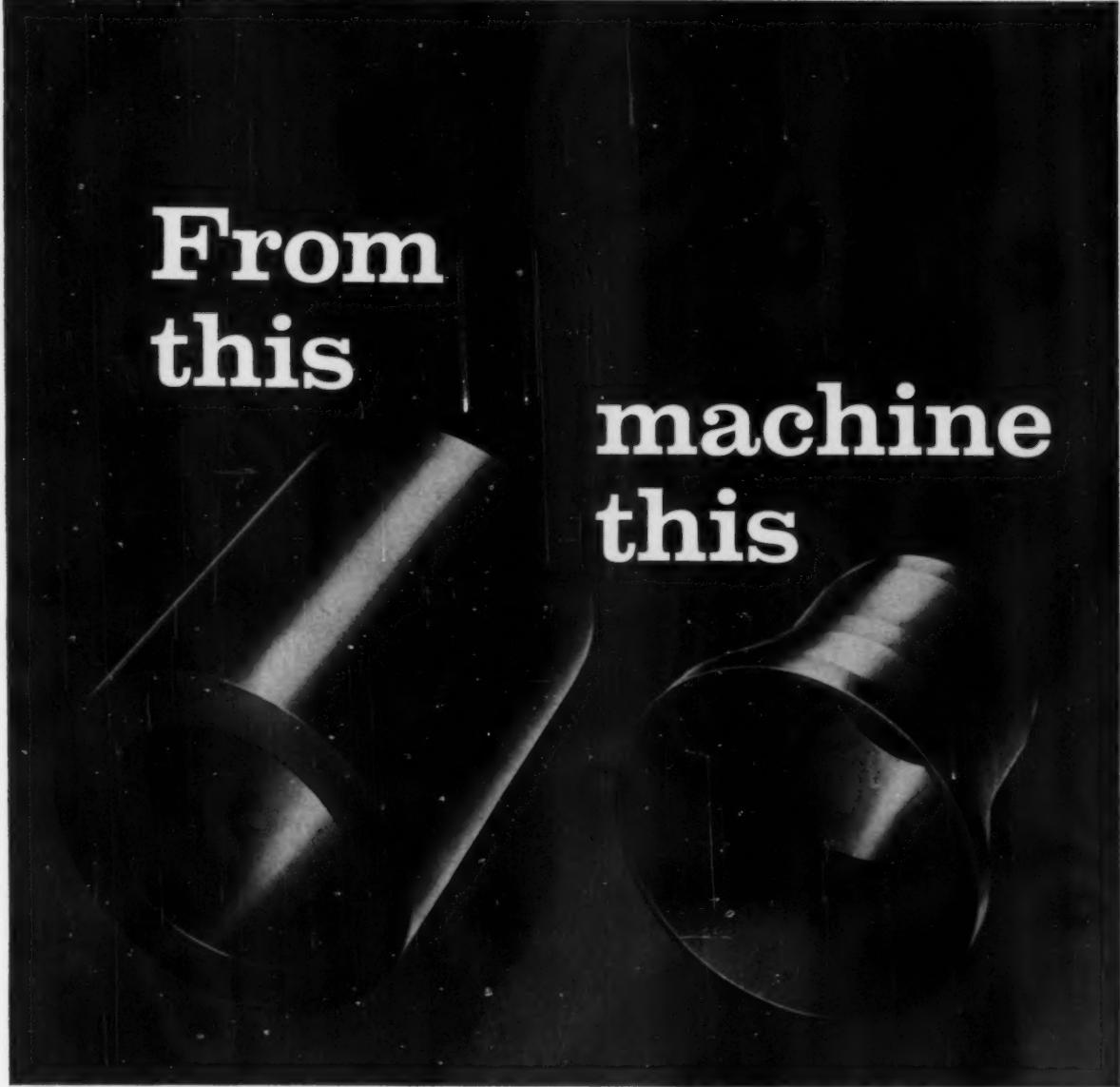
Feb. 7-9, 1961: 16th Reinforced Plastics Div. Conference, Edgewater Beach Hotel, Chicago, Ill.

June 5-9, 1961: 9th National Plastics Exposition and S.P.I. National Plastics Conference, Coliseum and Commodore Hotel, New York, N. Y.

Other groups

July 11-15: National Housewares Manufacturers Assn., 33rd National Housewares Exhibit, Convention Hall, Atlantic City, N. J.

July 19-21: 1960 Western Packaging & Materials Handling Exposition, Pan Pacific Auditorium, Los Angeles, Calif.—End



From
this
machine
this

R/M molded rods and tubes for missile research

Take advantage of famous R/M Style 150RPD molding compound in tubes and rods already molded for your developmental work.

You save the cost of dies and molding by machining prototype parts from rods and tubes supplied by R/M in sizes from 1½

to 15 in. OD by 15 in. long; or 21 in. OD by 4 in. long.

High-temperature parts made from this molding compound exhibit controlled ablation, good structural strength, excellent thermal-insulating properties, and low thermal diffusivity. Extra-long spinning-grade asbestos

fiber provides unusual physical stamina and contributes to high strength-to-weight ratio.

When you have developed and tested your prototype parts, you or your fabricator can then get the desired R/M molding compound in production quantities. Write or call for further information.



RAYBESTOS-MANHATTAN, INC.

Reinforced Plastics Department, Manheim, Pa.

SPECIALISTS IN ASBESTOS, RUBBER, ENGINEERED PLASTICS, SINTERED METAL

COMPANIES...PEOPLE

Appointments, promotions, and relocations in the plastics industry.

The Dow Chemical Co. promoted the following salesmen to position of account mgr., a new classification: **William M. Jackson**, plastics sales, Atlanta, Ga. office; **Denis J. Mullins**, **Stanton D. Smith**, **Frank J. Ward**, and **Henry B. Weis**, all with plastics sales, New York, N. Y. office.

Allied Chemical Corp.—**Plastics & Coal Chemicals Div.**: **John C. Esher** appointed dir. of sales. With the company since 1937 in production control, purchasing, planning, and chemical sales depts., he was most recently gen. sales mgr., plastics and resins. **Roger E. Caffier** appointed chemicals product mgr.; **Dr. Harold**



John C. Esher

A. Hoppens named dir. tech. service; **Dr. R. W. Dornte** appointed dir., Glenolden, Pa. research laboratory; **Kenneth D. Meiser** now asst. dir.—engineering, and **Dr. Ray L. Feder** named asst. dir.—development, tech. dept. **Kenneth E. Walker** appointed sales rep., southeastern dist., and **John F. Strauss**, sales rep., Cleveland, Ohio office.

National Aniline Div.: **William B. Yarborough** appointed a v-p. He will be responsible for research, development, and engineering.

Monsanto Chemical Co.—**Plastics Div.**, Springfield, Mass.: **Dr. Edgar E. Hardy** appointed assoc. dir. of research; **Dr. Seymour Newman** named group leader for physical chemistry research. **Sarkis K. Garibian** and **Otho E. Harris** joined the research dept.; **Donald F. Anderson**, the engineering dept.; **Jean P. Bourgault** and **John J. Kelleher**, the sales dept.; and **Henry Rotstein**, joined the production tech. service dept.

Union Carbide Corp.—**Union Carbide Plastics Co.**: **Gerrit V. Lydecker** appointed New England asst. regional mgr.; **Ernest L. Formann**, tech. sales rep., assigned to metropolitan New York area and, **Douglas L. Peterson** appointed tech. sales rep., N. Central region for Bakelite polyethylene, phenolic, styrene and vinyl resins for molding and extrusion. **Fred Wurtzell** appointed wire and cable market mgr.

Visking Co.: **Leo A. McCabe**, previously gen. mgr., **E-Z Packaging Corp.**, Chicago, Ill., appointed PE film sales specialist to the laundry and dry cleaning industry.

Enjay Co. Inc., petrochemicals firm, is now **Enjay Chemical Co.**, a div. of **Humble Oil & Refining Co.**, with

headquarters in New York, N. Y. **J. E. Wood III**, former pres. of Enjay Co., is pres. of the new div.

Pee Cee Tape & Label Co., div. of **Eureka Specialty Printing Co.**: **Don Gevirtz** named gen. mgr. of the three divs. with plants in Los Angeles, Calif., St. Louis, Mo., and Dumont, N. J. **Norman Hall** appointed Eastern operations mgr. **Robert Buckley** is gen. sales mgr. and **Charles Richardson** appointed prod. mgr. The company manufactures pressure-sensitive labels.

Celanese Corp. of America: **Kenneth C. Loughlin**, former exec. v-p., elected pres., succeeding **Harold Blanck**, who remains chmn. and chief exec. officer. **Harry B. Bartley Jr.** appointed field sales mgr. of **Celanese Chemical Co.**

Plastic Food Container Assn. is a newly formed national trade group of manufacturers of injection molded and vacuum formed food containers. Its general objectives are to provide better quality containers for grocery, dairy, and drug industries. **R. F. Smith**, **Sealright Pacific Ltd.**, is pres., and **M. J. McCabe**, **Neatway Products Inc.** is v-p. The association has headquarters at 333 N. Michigan Ave., Chicago, Ill.

Imperial Color Chemical & Paper Dept., **Hercules Powder Co.**: **Alfred E. Van Wirt** appointed asst. gen. mgr.; **Nathan W. Putnam**, asst. gen. mgr.—dir. pigment color sales; and **Laurence R. Sherman**, mgr., pigment color div.

Pearce-Simpson Inc., Miami, Fla. electronics mfr., established a Molded Plastics Div. at 3950 N. W. 28th St., Miami. **Erik Loveland** is plant mgr. of the new custom molding div., formerly the **Varney Plastics Co.**

National Cleveland Corp.: **Glenn A. Tanner** appointed dir. of sales for the Plastics Div., which includes **Auto-Vac Co.**, **Auto-Blow Corp.**, and **Plastics & Chemicals Div.**, all of Bridgeport, Conn. **William F. Blamey**, formerly asst. sales mgr., is now mgr. of Auto-Vac Co. **Mrs. Irene E. Ledermann**, formerly sales mgr. of Kautex-U. S. Sales Co. Inc., joined Auto-Blow Corp. as asst. to Mr. Tanner.

Narmco Materials Div., formerly **Narmco Resins & Coatings Co.**, Costa Mesa, Calif. mfr. of structural adhesives and reinforced plastics, established a new East Coast sales headquarters at 600 Old Country Rd.,

Garden City, N. Y. **Thomas E. Holdridge**, formerly tech. field sales mgr. of the home office, appointed Eastern region sales mgr. The company is a div. of **Narmco Industries Inc.**, San Diego, Calif., which together with all its divs. recently became a wholly-owned subsidiary of **Telecomputing Corp.**, Los Angeles, Calif.

H. Muehlstein & Co. Inc., processors, dealers, and distributors of plastics and rubber raw materials, moved its home office from 60 E. 42nd St., to 521 5th Ave., New York, N. Y. The increased facilities enable the company to concentrate all its home activities at one location.

Radiation Applications Inc. moved from 42-30 24th St. to larger offices and laboratories at 35-40 37th St., Long Island City, N. Y., where production will include radiation-treated Teflon, polyethylene, and other plastic materials.

Pyrofoam Corp., Norristown, Pa. custom molders of expandable polystyrene, opened a sales office at 520 Fifth Ave., New York, N. Y.

William DeWitt Jr. appointed v-p of **DeWitt Plastics**, newly formed div. of **Shoe Form Co. Inc.**, Auburn, N. Y. makers of plastic baitboxes and fishing tackle. The parent company is a mfr. of plastic shoe and hosiery forms.

Peterson Electronic Die Co. Inc., 199 Liberty Ave., Mineola, N. Y., is the new name and address of **A. W. Peterson & Sons Die Co. Inc.**, 131 Prince St., designers and fabricators of electronic heat-sealing dies.

Eastman Chemical Products Inc., **Plastics Div.**: **John Adams** named plastics sales development mgr. and **John T. Moore**, asst. sales mgr., Kingsport, Tenn. **T. Earl Dudney** heads the Leominster, Mass. sales office. **Jerry L. Flora** and **Benny P. Fulker** Jr. appointed sales reps., Chicago, Ill. and **Noel H. Malone Jr.** assigned to New York, N. Y. office.

Plywood & Plastics Inc. is the new name of **The Plywood Center**, Richmond, Va. distributor of Plexiglas, formica, fibrous glass panels, and other plastics supplies.

Owens-Illinois Glass Co. established a plastics products dist. sales office at 1809 First National Bank Bldg., Baltimore, Md., to cover the Charlotte, N. C., Philadelphia, Pa., Baltimore, and Richmond, Va. branches of the company. **Frank M. Harris** of the company's (To page 254)



MARTIN **RUDOLPH** VELBERT (Germany)

Machines and Automatons for the production of hollow bodies of thermoplastic materials



Machines for the Blowing of Plastic Containers

The installation shown above represents blowing equipment for the manufacture of hollow bodies of thermoplastic materials having a capacity of up to 100 L. The said machines are built for the manufacture of hollow bodies of up to 200 L. capacity. In addition to the said barrels, the installations may be used for the manufacture of cans, the decorative figures of up to normal life size, as well as the manufacture of tanks and bodies of all types for technical uses.

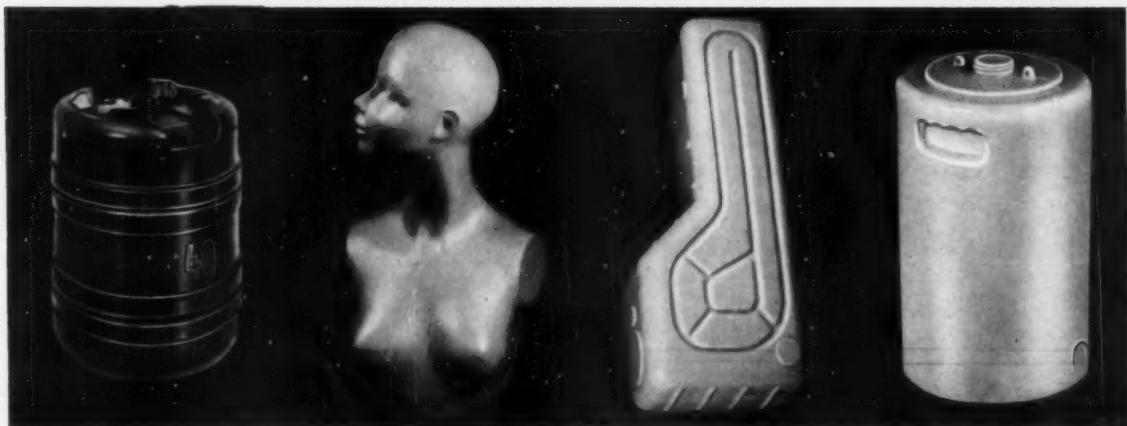
During the "Interpack 60" and during the Industrial Fair of Hannover, our installations shall be exhibited in our Velbert Plants (from April 10th to May 10, 1960). Our information stand at the "Interpack 60" bears No. 7408 and is located at the head (department) G, telephone No. 492493.

40 Liter Can

Decorative Figure, Feminine Bust

Tank for Tractors

Can of 25 L. capacity



COMPANIES...PEOPLE

(From page 252)

N. Y. dist. office, named dist. mgr., Lee N. Jarech, sales asst.

Gilman S. Jacobs appointed sales mgr. for Gilbert Plastics & Supply Corp., Baltimore, Md. distributor of resins, molding compounds, etc.

James L. Foster appointed mgr., polyethylene sales, Goodrich-Gulf Chemicals Inc., Cleveland, Ohio.

Richard W. Miler, formerly v-p of Bakan Plastics Inc., San Juan, Puerto Rico, joined Baker Perkins' Chemical Machinery Div., Saginaw, Mich., as div. project engineer in charge of plastics.

Lawrence V. Howenstine named tech. sales engineer for the plastics sales branch of Phillips Petroleum Co.'s international dept. He is located in the sales and development div. offices in New York, N. Y.

Joe R. Brown appointed sales mgr. of Shaw Insulator Co., Irvington, N. J. custom molder.

Robert E. Swisher named to newly created post of v-p, marketing, by Alsynite, Div. of Reichhold Chemi-

als Inc. Alsynite, mfr. of translucent reinforced fibrous glass panels, has headquarters in San Diego, Calif. and additional plants at Paterson, N. J., and Portsmouth, Ohio.

Bernard B. Bowling promoted from sales rep. to newly created post of sales promotion mgr. for Seiberling Rubber Co. plastics div.

James H. Brodie, appointed sales mgr., reinforced plastics div. of Fabricon Products, div. of Eagle-Picher Co.

L. N. "Buck" Tinkham promoted to newly created post of asst. sales mgr., Plastics & Rubber Products Co., Los Angeles, Calif. mfr. of O-Ring compounds.

Frederic W. Hammesfahr appointed dir., commercial development dept., J. T. Baker Chemical Co., mfr. of molding compounds.

Richard W. Arms named product specialist for United States Gasket Co., Plastics Div. of Garlock Inc., Camden, N. J. He will be responsible for the development and sales of the company's complete line of thermoplastic products.

William G. West appointed sales mgr. of The Stanley Chemical Co., subsidiary of The Stanley Works,

East Berlin, Conn. He was formerly gen. sales mgr. of The Borden Chemical Co.

Glenn A. Farno named sales mgr. —chemicals of Food Machinery & Chemical Corp.'s Chemicals & Plastics Div. The div. makes plasticizers, resins, and organic intermediates.

Henry R. Lasman appointed to newly created position of mgr., Organic Chemicals Div., National Polychemicals Inc., Wilmington, Mass. producer of a line of synthetic resins and organic chemicals.

Jeal Sugarman, chemist with the central research laboratories, promoted to field sales rep. of Antara Chemicals, a sales div. of General Aniline & Film Corp. He will work out of Dallas, Texas.

Sumner H. Levin appointed tech. dir. of The Blane Corp., Canton, Mass. mfr. of vinyl and polyethylene compounds and color concentrates.

J. Whitney MacDonald elected pres. and gen. mgr. of Syncro Resins Inc., Bethel, Conn. mfr. of thermosetting resins for the paper, abrasive, and other industries.

Earl R. Peterson appointed sales mgr., western div., Taylor Fibre Co., with headquarters at the company's

DON'T OVERLOOK

LATENTACID ACCELERATOR M
(Methyl Para Toluene Sulfonate)

LATENTACID ACCELERATOR E
(Ethyl Para Toluene Sulfonate)

WHEN COMPOUNDING THERMOSETTING RESINS SUCH AS UREA FORMALDEHYDE OR MELAMINE RESINS. ALSO USEFUL AS HARMLESS COMPOUNDS FOR METHYLATING AND ETHYLATING PURPOSES.

GLAD TO HAVE YOUR INQUIRIES ON FURTHER TECHNICAL DETAILS.

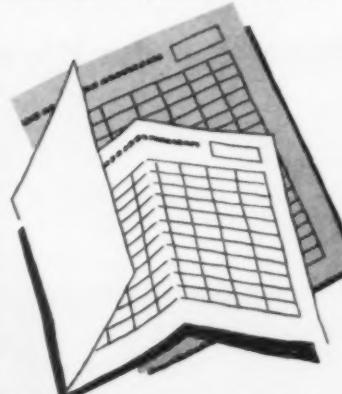
VERONA DYESTUFFS
A DIVISION OF VERONA PHARMA CHEMICAL CORPORATION
Manufacturers of Intermediates, Dyestuffs, Organic and Aromatic Chemicals

SPRINGFIELD ROAD, UNION, NEW JERSEY

BRUNSWICK, NEW JERSEY • PROVIDENCE, RHODE ISLAND • ROCK HILL, SOUTH CAROLINA

plus the well-known specialty products of
BAYER LEVERKUSEN - CASSELLA MAINKUR

NOW available in two charts...a thorough breakdown of what is presently available in self extinguishing plastics. Almost 400 resins and molding compounds, films, sheeting, laminates and foams are noted by:



Manufacturer
Trade name and number
Type of resin used
Tests passed
Tensile strength
at 72°F, PSI
Impact notched izod
at 72°F FT-LB/IN of notch
Hardness (1)
Specific gravity
Heat distortion points °F
Dielectric strength V/M
Light stability
Colors available

Self Extinguishing Plastics Material

Reprinted from the November 1959 and April 1960 MODERN PLASTICS they will be mailed at the pre-paid price of \$.50 for the both. Quotations for quantity orders (100 and up) available on request.

MODERN PLASTICS
575 Madison Avenue, New York 22, New York

LaVerne, Calif. plant. He replaces Edward J. Guelpa, recently named gen. mgr.

Robert M. Dunlap appointed sales mgr., Davis Products Inc., Van Nuys, Calif. producer of a variety of inflatable plastic products.

Jerry Marcell, formerly design engineer for the mechanical div., named field service engineer for G. T. Schjeldahl Co.'s polyethylene bag-making machines.

Richard G. Hayes named to newly created post of tech. consultant on urethanes for Dayco Corp., formerly Dayton Rubber Co. He will be responsible for applications of flexible, rigid, and solid urethanes.

John F. O'Brien joined Hysol of California, a div. of Hysol Corp., Olean, N. Y. mfr. of epoxy compounds, as tech. field salesman.

Harry K. Collins appointed exec. v-p and gen. mgr. of the Paraglas (reinforced plastics) Div., Air Logistics Inc., Pasadena, Calif.

Lewis N. West appointed mgr., chemicals and plastics dept., Getz Bros. & Co., San Francisco, Calif. export and import firm.

Carl F. Massopust named dir.—product R & D, plastics processing div., Rexall Drug & Chemical Co. This div. includes the plastics film, container, housewares, pipe, valves, and fittings mfg. subsidiaries.

Robert H. Cottle named Los Angeles, Calif. dist. mgr. for Formica Corp., a subsidiary of American Cyanamid Co. He succeeds Glenn H. Taylor, who retired.

Dr. Rudolph D. Deanin, chemist, joined DeBell & Richardson Inc. consulting engineers.

Thomas R. Grimes appointed sales mgr. of Ensolite products div. of U. S. Rubber Co. Ensolite is a closed-cell vinyl sponge material used for water safety vests, liners for crash helmets, animal protection pads, etc.

John S. Harris joined American Plastics Corp., custom molding subsidiary of Heyden Newport Chemical Corp., as sales rep.

Harry J. Pratt appointed mgr. of the Amos Molded Plastics Div. of Amos-Thompson Corp., located at Edinburg, Ind.

Franklin N. Ritschel Jr. joined B. B. Chemical Co., Cambridge, Mass., as a sales engineer for the company's line of urethane coatings.

Dr. Sallie A. Fisher, previously with Rohm & Haas Co., joined Robinette Research Laboratories. (To page 257)

Luigi Bandera

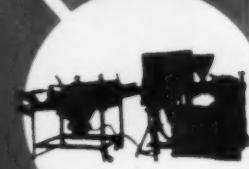
Extruder
Mod. TR 45



Plant for
blown tubes
in Polyethylene



Take-off
for blow tubes



Take-off
for blow tubes
in PVC



material

For the
working
of
plastic

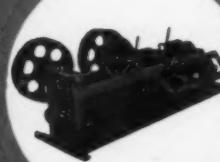
Processor
for plastics



Automatic
cutter for
pipes and
profiles



World Distributors
—OVEMA s.r.l.—
—MILANO (ITALY)—
Via Fontana 5
Tel. 705.735—709.358



Take-off and
winding-machine
for cables

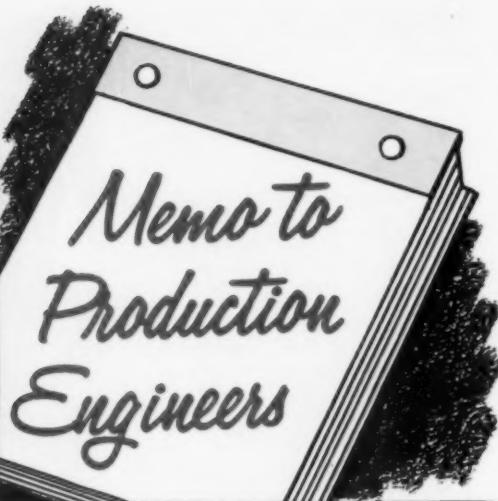
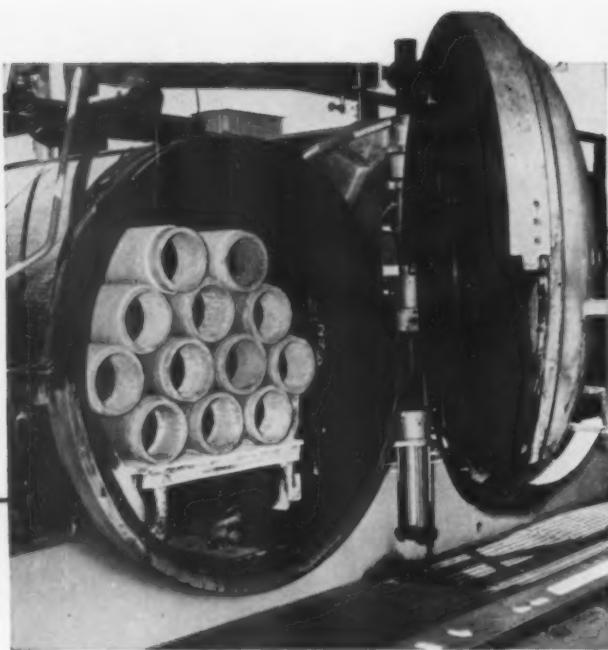


Scrap

The Rainville Company Inc.

sole agents for U.S.A.

New York, N.Y.—657 Franklin Avenue, Garden City, L.I. Tel. Pioneer 6-7135
Glendale, Calif.—1429 South Garfield Avenue, Tel. AT 4-3940, or 3-4465

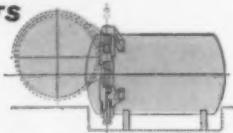


◀ Adamson 90" dia. Hi-Lift Swing Door installed at Johns-Manville Products Corporation, Manville, N. J. One of many Adamson doors now in operation, or on order, for use in steam-curing TRANSITE® Pipe at J-M Plants in the U. S. and Canada.

Here are 6 important reasons why you should specify ADAMSON UNITED Hi-Lift Swing Vulcanizer & Autoclave Doors

1 LOWER INSTALLATION AND OPERATING COSTS

Adamson's lift-swing feature eliminates need for extended pit and expensive bridging. For example, on a 90" dia. door you can use an easily-handled loading bridge as short as 22".



2 TIGHT, LEAKPROOF SEAL

Adamson's special heat-resistant, self-sealing gasket utilizes vessel's internal pressure to assure a positive, leakproof seal.

3 EFFICIENT SLIDE-LOCK DESIGN

Provides virtually 360° of locking surface between door and mating shell ring. Twice the locking area of conventional breech-lock doors!



4 SAFE, RELIABLE OPERATION

Equipped with automatic door locking pins. Can be furnished with optional steam interlock controls for complete safety. Other built-in safety features included.

5 STRONGER CONSTRUCTION

Conventional castings are replaced by sturdy pressed steel head welded to continuous roll forged locking rings.



6 FAST OPENING AND CLOSING

Quick-unlocking, vertical-lift action powered by hydraulic cylinder. Door swings easily on anti-friction and bronze sleeve bearings. Simple, trouble-free operation.

→ **ADAMSON UNITED** ←

7067

COMPANY

730 CARROLL STREET, AKRON 4, OHIO

Subsidiary of United Engineering and Foundry Company
Plants at Pittsburgh, Vandergrift, Wilmington, Youngstown, Canton



We offer a wide range of door sizes and pressures, available as integral equipment on vessels supplied by us, or as separate units for mounting on tanks made by other manufacturers. Write for catalog No. 562.

DESIGNERS AND BUILDERS OF BASIC MACHINERY AND EQUIPMENT FOR COMPLETE PROCESSES

COMPANIES...PEOPLE

(From page 255)

consulting organization for plastics and other industries, as assoc. dir. of research.

Clifford R. Smith, previously with the Borden Chemical Co., appointed sales engineer for the Press Div., **F. J. Stokes Corp.**, Philadelphia, Pa. mfr. of molding equipment. He will work out of Dayton, Ohio.

Ernst G. Kuehn appointed European rep. for **Jefferson Chemical Co. Inc.**, Houston, Texas producer of ethylene and propylene derivatives.

Loren J. Simer named product sales mgr. for **Carlon Products Corp.**, Aurora, Ohio plastic pipe producer.

H. Edward Rodgers joined **Chicago Molded Products Corp.** as sales rep. for the Custom Molding Div.

Russell W. Buchanan appointed prod. control mgr. **Cary Chemicals Inc.**, Flemington, N. J. mfr. of polyvinyl chloride resins and compounds.

New reps.

Muro Plastics Co., 801 Spring St., Seattle, Wash., appointed by **Modern Plastic Machinery Corp.**, Clifton, N. J. as exclusive rep. in the northwestern states, Alaska, Hawaii, and parts of Canada . . . **Francis Shaw Ltd.**, Burlington, Ont., Canada, appointed exclusive Canadian rep. by **Thoreson-McCosh Inc.** for the company's line of hopper-dryers, loaders, and shear-way granulators . . .

Berton Plastics Inc., New York, N. Y., named as distributor for **The Dow Chemical Co.**'s styrene monomer . . . **Kreidl K.G.**, Vienna, Austria, appointed by **Fragrance Process Co.**, New York, as European rep. for its process of impregnating PE film and other products with aromas . . . **Seiberling Rubber Co.** appointed **Graves T. Lewis**, Atlanta, Ga., and **B. Elmer Steele**, Knoxville, Tenn., as Southern sales reps. for its Seilon rigid thermoplastic sheet materials.

Corrections

"How to Choose the Correct Colorant" (MPI, Apr. 1960, p. 82): Light resistance refers to masstone and tint (third and fourth columns in green portion of chart) only, and not to heat. "Dyers" (bottom of first column) should read "dyes."

"Modern Plastics Chart of Self-Extinguishing Plastics Materials—II" (MPI, Apr. 1960, pp. 93-98): Correct spelling for the following manufacturer's name is: **Panelyte Div.**, St. Regis Paper Co.

"Research labs" (MPI, Apr. 1960, p. 158): Booklet described covers only activities of **DeBell & Richardson Inc.**, is not a summary of all research laboratories available to plastics industry.—End

Save on Plastics!.... (Raw Materials)

WOLOCH offers *complete* service at the *lowest rates* in the Thermoplastic field. This centralization enables you to fill *all* your plastic needs from one quality source, while effecting considerable savings in processing and materials. Try WOLOCH when placing your next order. You'll be glad you did!

For your convenience, an outline of WOLOCH services:



Buys and Sells:

Virgin and Reprocessed Polyethylene: Low, Intermediate and High Density. Polystyrene: Crystal Clear, Colors, High Impact in Natural and Colors. Nylon: Reprocessed Pellets in Natural, Black and Colors. Vinyl: Virgin Resins. Scrap Plastics and Off-Specification Resins: all materials and qualities. Surplus inventories of Thermoplastic materials. Our large inventory of all materials assures speedy delivery.



Custom Compounds:

- Our modern Custom Compounding Department is widely noted for accomplishing the difficult.
- Painstaking care is always taken to formulate orders to your *exact* specifications.
- Rigid quality control assures absolute uniformity of pellets, cleanliness and color.
- We will work with your material or ours.

george
Woloch CO., INC.

514 West 24th Street, New York 11, New York
Cable Address: Geowoloch, New York

Offices & Warehouses:

New York

Newark

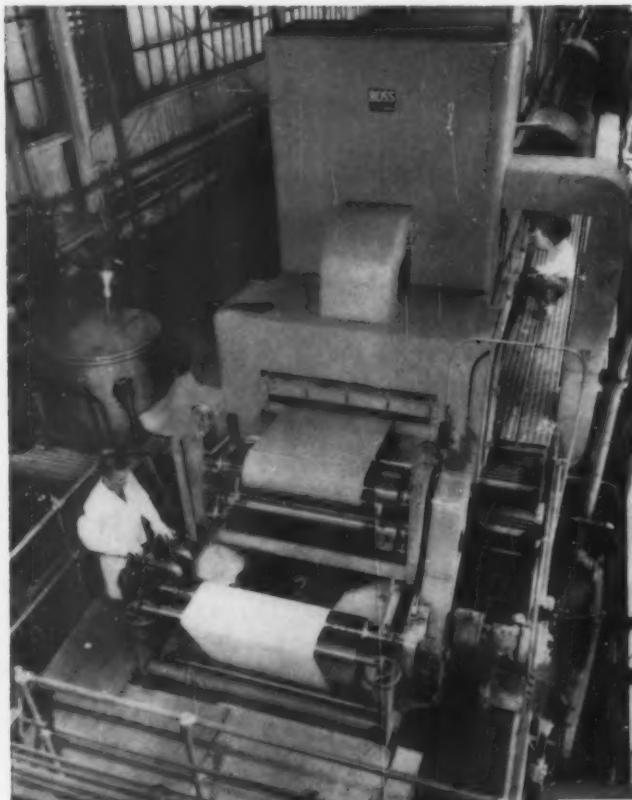
Jersey City

Akron

At Woloch, personal service is our byword
... customer savings our aim.

ROSS/WALDRON

Saturator-Treater Line



Installation at Richardson Company, Melrose Park, Illinois

Here is a typical Ross/Waldron Saturator-Treater Line "in production". The standard Waldron Saturator is set to precisely apply just the right amount of saturant to the web—the standard Ross Oven removes the moisture through precisely controlled heating zones. Ross and Waldron team their standard units and special engineering skills to give you top quality production.

Your inquiry will receive prompt attention. To save additional time, it would be helpful if you outline your specific problem.

WALDRON-HARTIG DIVISION
Midland-Ross Corporation
Box 701 • New Braunfels, N. B.

"Technical competence in such process machinery"



WM-450

STANDARD EQUIPMENT

Engineered
FOR
QUALITY
PRODUCTION

Typical Applications for Ross/Waldron Saturator-Treater Lines

- Decorative laminates such as table tops, wall covers, counter tops, etc.
- Industrial insulations such as rods, bushings, gaskets, tubes, panels, and also latex impregnated papers, etc.

**Current users of Ross/Waldron Saturator-Treater
Lines**

General Electric Company
Westinghouse Electric & Eng. Co.
Formica Corporation
Synthane Corp.
Continental Diamond Fibre Corp.
Taylor Fibre Corp.
St. Regis Paper Co.
Consolidated Water Power & Paper Co.
Arborite Co. Ltd.
Latex Fibres Industries
Endura Corp.
Johnson & Johnson
Fabricom Products
Richardson Company

*Announcing
our new name...*

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY



Effective May 31st, the name of Enjay Company, Inc. changed to Enjay Chemical Company, a division of Humble Oil & Refining Company. Enjay Chemical Company will continue to serve modern industry with a complete line of petrochemicals, including Butyl rubber, solvents, resins, plastics, and additive compounds for fuels and lubricants. As a division of Humble Oil & Refining Company, the company is determined to become even more important in the growing petrochemical field.

As the pioneer in petrochemicals, and a leader in the marketing of chemical raw materials, it has always been the policy of Enjay to help customers develop new products and improve existing ones. Enjay now has ten sales offices — including the new one recently added at Houston, Texas — standing ready to offer immediate handling of product orders and requests for technical service. Strategically located distribution points also offer benefits of prompt deliveries.

Enjay Chemical Company looks

forward to giving its thousands of customers continued and unequalled technical service . . . backed by one of the world's largest research organizations.

HOME OFFICE:
15 West 51st Street, New York 19, N. Y.

OTHER OFFICES:

Akron	Boston	Charlotte
Chicago	Detroit	Houston
Los Angeles	New Orleans	Tulsa

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY



CLASSIFIED ADVERTISEMENTS

EMPLOYMENT

BUSINESS OPPORTUNITIES

USED OR RESALE EQUIPMENT

Machinery and Equipment for sale

MOST MODERN PACKAGING and processing machinery. Available at great savings. Baker Perkins, W & P, and Day Double Arm Steam Jacketed Heavy Duty Mixers—25, 50, 75, 100, 150 and 200 gal. capacities. Devine 650 gal. Jacketed Double Spiral Mixer. Day 2½ gal. MDA Mogul D.A. Vac Experimental Mixer. Fitzpatrick Models D, K-7 and K-8 Stainless Steel Commuters. Werner & Pfleiderer 3,000 gal. and 3,500 gal. Jacketed Double Arm Mixers. Stokes Models R, RB-2 and DD2 and Eureka Tablet Machines. Colton 2RP, 3RP, 3B, 5½ T Tablet Machines. Mikro Pulverizers. Models 1SH, 2TH, 3TH and 4TH. Day, Robinson 50 to 10,000 lbs. Dry Powder Mixers. Jacketed and Unjacketed. Also wood and enamel. Day Imperial 75 gal. Double Arm Mixer. Sigma Dispersion Blades. Package Machinery, Hayssen, Scandia, Wrap King, Campbell, Miller Wrappers. Pneumatic Scale Automatic Carton Folder. Bottom Sealer, Wax Liner, Top Sealer with Interconnecting Conveyors. Standard Knapp, A-B-C, Ferguson Carton Sealers. Union Standard Equipment Company, 318 Lafayette Street, New York 12, N.Y. Phone: CANal 6-5334.

FOR SALE: 1—Baker Perkins 100 gal. Sigma blade Mixer; 1—Baker Perkins size 16 TRM 150 gal. double arm Vacuum Mixer; 1—No. 1 Ball & Jewell Rotary Cutter; 2—Mikro Pulverizers, S.S. Bantam, #15H; 6—Stokes Model DD2, DS3, D3, and B2 Rotary Preform Presses. Also: Sifters, Banbury Mixers, Powder Mixers, etc. partial listing; write for details; we purchase your surplus equipment. **BRILL EQUIPMENT CO.**, 35-55 Jabez St., Newark 5, N.J. Tel: Market 3-7420.

FOR SALE: Ovens, Grinders, Powder Mixers, Injection Molding Machine 1 oz. to 60 ozs. never used and used. Two-head Bottle Blowing Machine. Acme Machinery & Mfg. Co. Inc., 20 South Broadway, Yonkers, N.Y. Yonkers 5-0900. 102 Grove Street, Worcester, Mass., Pleasant 7-7747.

FOR SALE: Stainless reactors or resin Kettles: 3500, 2200, 1900, 1300, 1000, 750, 500, 350 gal. jktd. and agit. Baker-Perkins dbl. arm mixers: 200, 100, 50 gal. capacity, steel or stainless. Perry Equipment Corp., 1429 N. 6th, Phila. 22, Pa.

FOR SALE: Hydraulic press 48" x 48", ten openings, 3" daylight, 250 tons, with pump and controls, installed in our plant. Reply Box 6554, Modern Plastics.

FOR SALE: Plastic Laminating Machines, Hydraulic, all-electric & water cooled; equipped with accessories, ready for production: 1. Size 10" x 12" with four openings; 2. Size 5½" x 9" with four openings; 3. Size 6" x 6", two openings, Carver, P. O. Box 875, Milwaukee, Wis.

HYDRAULIC PRESS: Two 40" x 40" steam heated platens for 2,000 P.S.I., upacting 14" dia. ram; 14" daylight opening, 14" stroke. Available with Barnes Hydraulic Pump for 2,000 P.S.I. complete with 4 way valve and 5 H.P. motor mounted on tank. Excellent condition. Reasonably priced at \$3,000. Reply Box 6561, Modern Plastics.

HYDRAULIC PRESS: R. D. Wood 2280 ton Laminating Platen Type. Six Rams, 18" Dia. Heating Platens 24" x 144", 10" Stroke. Morey Machinery Company, 383 Lafayette St., N.Y. 3, N.Y. AL 4-6560.

FOR SALE: One Cumberland #0 Plastics Granulating Machine equipped with 2HP, 1800RPM, J/60/220/440 open ball bearing motor and flexible coupling. Used very little, like new. \$350.00 FOB St. Louis, Missouri. Celucot Corporation, 6161 Maple Ave., St. Louis, Missouri.

FOR SALE: 3 Ball & Jewell rotary cutters, 10, 7½ and 2 HP; 1 Stokes model 235-50 ton automatic molding press; 1 M P M 2½" electrically heated plastics extruder; 3 compression molding presses 200, 150 and 100 tons; 3 Stokes preform presses models FB and 280-C. Chemical & Process Machinery Corp., 52-9th St., Brooklyn 15, N.Y. HY 9-7200.

FOR SALE: Two Reed Prentice Inj. Molding Machines, model 10D-12 oz. (1954) complete with instruments, controls, etc. for immediate removal. Both machines are in excellent condition and priced reasonably. Call, write, or phone for appointment to see in operation before removal. Rogers Plastic Corporation, West Warren, Massachusetts. HE 6-7744. Ask for John Krach.

FOR SALE: MPM 3½" wire covering Extruder. New 3½" Plastic Extruder. Other sizes up to 6". Two new Farrel Birns, 14" x 30" two roll Mills, also Seco 6" x 12" and 8" x 16", 2-Roll Mills and Calenders, and other sizes up to 60". Watson-Stillman 240 ton, ten 24" x 56" platens. Baldwin-South, 200 ton Semi-automatic transfer Molding Press. Baldwin-South, 150 ton downstroke 48" x 40" platens. Stokes Standard 150 ton Semi-automatic. French Oil 120 ton self-contained. 120 ton Upstroke, 29" x 21" platens, 10" stroke. 60 ton Farquhar 50" x 50" platens, 30" stroke. Stokes 50 ton Semi-automatic 22" x 12" platens. 50 ton Birdsboro 24" x 20" platens. 30 ton Birdsboro 21" x 14" platens. Hydraulic Pumps and accumulators. Despatch elect. Heated Ovens and other types. New 3½ oz. Bench Model Injection Molding Machines. Van Dorn 1 oz. and 2 oz., other sizes to 100 oz. capacity. Baker-Perkins and Day Jacketed Mixers. Plastic Grinders. Stokes RD3 Rotary-Preform Tablet Machine, also single punch ½" to 4". Send for listings. We buy your surplus machinery. Stein Equipment Company, 107-8th St., Brooklyn 15, New York.

CHECK THESE SPRING VALUES: 60 oz. HPM Injection Molding Machine, late type, inspect on location. Complete with all controls equipped with exact weight feed and mold coolers. 600 Ton Adamson Multi-opening Hydraulic Press, 26" diameter chrome-plated ram, slab side construction. Press contains nine 42" x 42" platens. New 1951. Stokes Model "R" and Colton Model 4½ T, single punch Tablet Presses. Individually motor driven. NRM 1½" Electrically Heated Plastic Extruder. Complete with wheelco panel board and Vari-speed drive. 75 Ton Baldwin-Southwick Transfer Molding Press, completely self-contained with all operating controls. Cumberland 2½" Rotary Scrap Cutter, complete with 10 HP motor. Cumberland #1½" Rotary Scrap Cutter with 3 HP motor. 2 oz. Watson-Stillman Vertical Injection Molding Machine. Completely self-contained with all operating and heat controls. 2½ oz. Van Dorn Full Automatic Injection Molding Machine. Also in stock: Van Dorn 1 oz. lever-operated Injection Molding Machine. Van Dorn 2 oz. Semi-automatic Injection Molding Machine. New 1955. NRM 2½", Royle 3½", Hartig 3½" and Adamson 6" Extruders. Also a complete line of Blenders, Mixers, Scrap Cutter, etc. for the Plastic and Rubber Industries. **WHAT DO YOU NEED? WHAT DO YOU WANT?** We Will Finance. Johnson Machinery Company, 683 Frelinghuysen Avenue, Newark 12, New Jersey. Bigelow 8-2500.

FOR SALE: Stokes 200 ton press bar control \$4000.00. 4 Barry Button Machines \$450.00 each. Molded Plastic Button Corp., 1333 Broadway, N.Y. 18, N.Y. LOnagre 5-4427.

Machinery Wanted

WANTED TO BUY: Used injection molding machines, oven, granulators. One machine or complete plant. Acme Machinery & Mfg. Co., Inc., 20 South Broadway, Yonkers, N.Y. Yonkers 5-0900. 102 Grove Street, Worcester, Mass. Pleasant 7-7747.

WANTED: One or more 150 and 200 Ton Stokes Compression semi-automatic presses. Reply Box 6546, Modern Plastics.

WANTED: Positive matched metal dies, approximately 10"-10" deep, 10-15" long and 6-10" wide; hardened steel construction, for reinforced plastics evaluation. Reply Box 6548, Modern Plastics.

WANTED: Used Watson-Stillman 4V-100 vertical injection molding machine. Forward photographs and complete data including price to Plasteck, Incorporated, Poteau, Oklahoma.

Materials for sale

FOR SALE: Black Reprocessed LINEAR P/E also other selected colors for extrusion or blow molding at 23/lb. Gold-Mark Plastic Compounds, Inc., 4-05 26 Ave., L.I.C., New York, RA 1-0880.

WE SPECIALIZE in "BLACKS." High Impact Styrene, Utility Black. Medium Impact Styrene, Utility Black. General Purpose Styrene, Utility Black. Lustre Black. Polyethylenes, Black. Butyrate, Black. The Larger the Order, The Lower the Price. Erie Plastics Company, Inc., 1221 Walnut St., Phone GL 2-2503, Erie, Pa.

FIBREGLASS SURFACING MAT: 500.00 sq. ft. of unused material in rolls, 600 ft. to 900 ft. long and 18 in. wide. Samples upon request; write or call. Plastic Trading Company, 1006 Prudential Bldg., Buffalo, New York, WA-4926.

Materials Wanted

WANTED: Urgently need any quantity of colored and crystal Butyrate Scrap, Sheet trim, Purgings, Parts, Reground. Claude P. Bamberger, Inc., Ridgefield Park, N.J. Hubbard 9-5330.

WANTED: Plastic scrap. Polyethylene, Polystyrene, Acetate, Acrylic, Butyrate, Nylon, Vinyl. George Woloch, Inc., 514 West 24th Street, New York 11, N.Y.

WANTED: GOOD clean lots of Hi-imp., Med. imp.; and Gen. Purp. Styrenes, Regrind or Pellets, straight colors or mixed colors. Top prices paid. Erie Plastics Co., Inc., P.O. Box 1068, Erie, Pa.

GET THE TOP MONEY FOR PLASTIC SCRAP: Now paying top prices for all thermoplastic scrap. Wanted: polystyrene, cellulose, acetate, vinyl, polyethylene, butyrate, acrylic, nylon. All types and forms, including rejects and obsolete molding powders. Fast action wherever you are located. **WRITE, WIRE, TODAY!** Reply Box 6556, Modern Plastics.

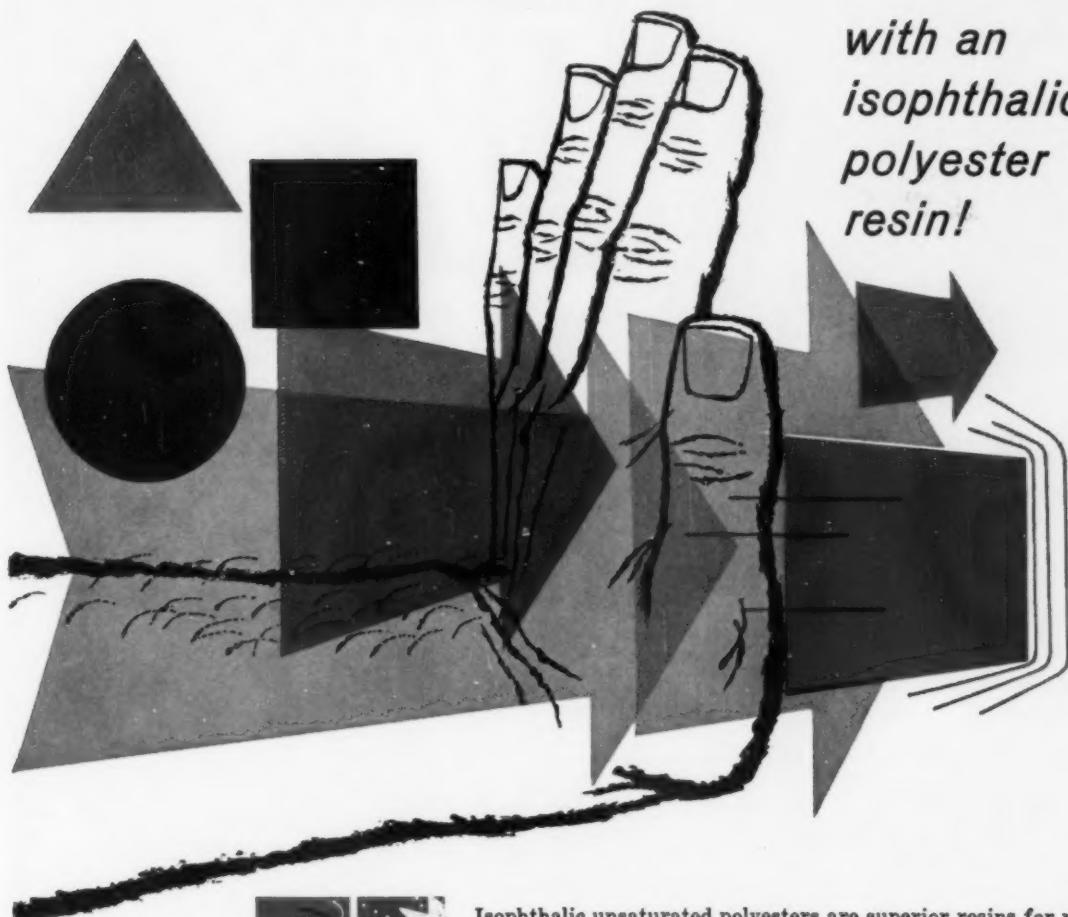
PLASTIC SCRAP WANTED: Styrene, Acrylic, Polyethylene, Butyrate, Acetate, Vinyl, Nylon, Etc. **WE PAY TOP DOLLAR** for your plastic scrap and surplus molding powders in any form. We also supply molding powders to the plastic industry at reasonable prices. Please contact for information. Philip Shuman & Sons, 571 Howard Street, Buffalo 6, N.Y. MA 3111.

THERMOPLASTIC SCRAP bought, sold and traded, all types. Plastic Trading Co., 1006 Prudential Bldg., Buffalo 2, N.Y. WA 4926.

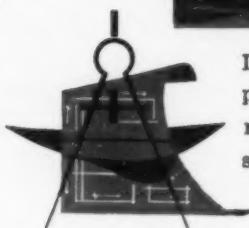
WANTED: Plastic of all kinds—virgin, reground, lumps, sheet and reject parts. Highest prices paid for Styrene, Polyethylene, Acetate, Nylon, Vinyl, etc. We can also supply virgin & reground materials at tremendous savings. Address your inquiries to: Gold-Mark Plastics Compounds, Inc., 4-05 26th Ave., Long Island City 2, N.Y. RAVenswood 1-0880. (Continued on page 262)

Push your product **OUT FRONT**

*with an
isophthalic
polyester
resin!*



Isophthalic unsaturated polyesters are superior resins for reinforced plastics products — providing greater physical strength, impact resistance; improved flexibility and adhesion; better heat distortion properties — *on exposure to time, temperature, water and weather.*



Isophthalic polyester resins offer manufacturers, designers, engineers and production people improved properties for planning better products to more rigid specifications and convenient production methods. More attractive product styling, better performance and greater reliability are all now possible.



Ask your resin supplier about Isophthalic polyesters or request Isophthalic polyester information and formulations from Oronite. Just contact the Oronite office nearest you.



ORONITE CHEMICAL COMPANY
A CALIFORNIA CHEMICAL COMPANY SUBSIDIARY

EXECUTIVE OFFICES • 200 Bush Street, San Francisco 20, California

SALES OFFICES • New York, Boston, Wilmington, Chicago, Cincinnati, Cleveland, Houston, Los Angeles, San Francisco, Seattle

FOREIGN AFFILIATE: California Chemical International, Inc., San Francisco, Geneva, Panama

6409

(Continued from page 260)

WE ARE IN THE MARKET for all types of thermoplastic scrap; also surplus or obsolete lots of reprocessed or virgin molding powders. D. Linder Plastics, Inc., 1825 Raspberry St., Erie, Pa. Phone GLendale 4-8146.

Molds wanted

OVERSEAS PLASTIC MOULDER having compression and injection moulding machines of 50/100 tons and 8/10 ounces wants permanent arrangement for getting steel moulds of electrical accessories, household and domestic articles on rental basis. Moulds will be returned in good condition. Those interested apply with photographs and terms of business to Box 6547, Modern Plastics.

MOLDS WANTED: Interested in purchasing injection or compression molds for consumer products, parts, novelties, or related items. Reply Box 6559, Modern Plastics.

WANTED: Multi Cavity Ash Tray Mold. Submit Samples or Drawings, Price, Condition. Reply Box 6574, Modern Plastics.

Molds for sale

FOR SALE: Complete set of injection molds for new, unique and popular priced Record Holder (45 rpm). Single cavity base mold. Double cavity side mold. Perfect condition, practically new. For more information, contact S. Berlin, The Malls Co., 3031 James Street, Baltimore 30, Maryland.

Help wanted

PLASTIC-EXTRUSION ENGINEERS: Initiative, incentive and some experience in processing and extrusion techniques preferred. New openings in technical department created by expansion program of a large, reputable polyethylene film producer. Salary commensurate with ability. Send resume to: Plastic Horizons, Inc., 1 Erie St., Paterson, N.J.

POLYESTER RESIN CHEMIST with B.S., M.S. or Ph.D. degree needed for expanding research department of progressive company. Experience in the field of unsaturated polyester resins is desired. Original work will be encouraged. Liberal benefits. Please send complete resume including present salary to: Dr. Jay E. Mell, Director of Polymer Development, Freeman Chemical Corporation, 211 East Main Street, Port Washington, Wisconsin.

TECHNICAL LABORATORY: An excellent opportunity for a young man to join the expanding Plastics Division of Spencer Chemical Company. This man should have a degree in engineering or a related field with experience in the field of thermoplastics. He will perform studies on extrusion and molding of polyolefins and nylon and will have some field technical service responsibilities. In reply, please send detailed resume to: Personnel Manager, Spencer Chemical Company, 610 Dwight Building, Kansas City 5, Missouri.

TECHNICAL SERVICE engineer: Should have experience in the use of polyester resins in the production of reinforced plastics. This position involves considerable customer contact in addition to some work in our laboratories. This company is well established in the synthetic resin field and is the chemical subsidiary of the H. H. Robertson Co. and offers a generous line of fringe benefits. Address replies to: Mr. K. A. Schafer, Freeman Chemical Corp., 211 E. Main Street, Port Washington, Wisconsin.

PIONEER MANUFACTURER of Epoxy Compounds and Epoxy Color Pastes needs representatives to follow up large number of fine sales leads in various parts of country. Write The Clinton Company, 1210 Elston Ave., Chicago 22, Illinois.

SUPERINTENDENT: Injection Molding. Well known established firm located in Metropolitan New York wishes to employ an energetic and qualified person capable of assuming complete charge of its molding and maintenance operation. Prefer a person having knowledge of new molding materials and techniques and ability to train department personnel. Opportunity to progress financially. Benefit program consists of company-paid major medical insurance and pension plan. All inquiries will be kept in confidence. Please send resume ad salary requirements to Box 6551, Modern Plastics.

PLASTICS BLOW MOLDING Foreman supervisor: Experienced on latest equipment techniques and materials. Opportunity with growth company in Metropolitan New York. State full experience and salary requirements. Chanal Plastics Corporation, 63-20 Austin St., Rego Park 74, New York.

SUPERVISOR: Product and Process Engineering: Position open for Mechanical Engineer with main experience in nylon injection molding and some experience in compression molding. To handle process development within the Plant and some travel and customer relations with regard to new product development. Responsible for supervision of design tooling and quality control. Age 30 to 45 years. Salary \$12,000 to \$15,000. Reply Box 6553, Modern Plastics.

SALES—FLEXIBLE PACKAGING: Outstanding opportunity for a self-starter to grow with expanding Plastics Division of well established Corporation which has diversified into packaging. Require minimum 5 years field sales experience, preferably Southern areas, in unsupported film and coated substrates: paper, paperboard, film, foil. Do not apply unless you have this background, possess a technical aptitude for flexible packaging, plus a genuine desire for advancement by consistent, intelligent application. Southeastern location. Starting salary commensurate with experience. Please forward detailed resume of personal history, experience, and salary requirements to Box 6555, Modern Plastics.

COLOR CHEMIST IN Thermoplastics to develop as color chemist as well as expand into general polymer studies in new thermoplastics field at modern, progressive company. B.S., M.S. or Ph.D. Level will be considered. Please submit a detailed resume; replies will be held in strict confidence. J. H. Saunders, Director of Research, Mobay Chemical Company, (Associate company of Monsanto Chemical Co.) New Martinsville, West Virginia.

DEVELOPMENT ENGINEERS: NRM has exceptional opportunity for top-quality project engineers. Substantial experience in blow molding or extruder design can lead to rapid advancement. Please send resume of education, experience, and salary requirements to E. E. Heston, Manager, Extruder Division, National Rubber Machinery Corp., 47 W. Exchange Street, Akron 8, Ohio.

SALESMAN: Experienced in virgin and reprocessed plastics to eventually take over as Sales Manager for a reprocessor. Excellent opportunity for the right man. Salary open. Operate generally in the Metropolitan New York-New Jersey area at present. Reply Box 6560, Modern Plastics.

PROGRESSIVE PLASTIC sales representative wanted in New York and New Jersey areas. Please reply Box 6566, Modern Plastics.

PRODUCT MANAGER (Technical Market Specialist) Glass Fiber Reinforcing Mats and Related Materials. The man we are seeking will be in charge of all sales and marketing of a new type of business for a division of a substantial company located in the middle west. He should have experience in reinforced plastics or reinforcing media. A college degree in chemistry or chemical engineering desirable. The man selected will report to the Division Manager. He will develop technical product knowledge, call on key accounts, plan promotional programs, etc. An attractive salary will be arranged and will include a substantial incentive. Preferable age 30-45. Please send your resume in complete confidence to Dept. 17-MP, Box 226, Church Street Station, New York 8, N.Y.

VINYL EXTRUSION SALES: Excellent growth opportunity for salesman experienced selling vinyl extrusions to various markets. Headquarters Boston area. Some travel required. Send resume with full details and salary requirements to: C. W. Erickson, The Borden Chemical Company, Division of The Borden Company, 350 Madison Avenue, New York 17, N.Y.

RESEARCH ENGINEER PLASTICS: New position in Research and Development offers unusual opportunity for engineer familiar with plastics evaluation field. Location is a new plastics laboratory to be completed shortly at Ponca City, Oklahoma. We need a graduate engineer with minimum of five years experience in plastics to help organize and conduct research program. This position will require a good knowledge of processing evaluation and the effects of different polymer structures on used properties. Send resume of background and salary requirements to: Personnel Relations Department No. 1, Continental Oil Company, Ponca City, Oklahoma.

PLASTICS ENGINEER: Experienced in designing compression molds, estimating, and capable of taking charge of compression molding department. Philadelphia area. Reply Box 6569, Modern Plastics.

PLANT MANAGER: Expanding Chicago corporation has exceptional position for man with sheet extrusion and vacuum forming experience. Man should have good extrusion background and ability to handle production problems. This is a permanent position offering growth and developmental opportunities. Good salary commensurate with ability. Excellent working conditions. Replies confidential. Reply Box 6563, Modern Plastics.

DEVELOPMENT ENGINEER: Immediate opening in the product and process development section. Previous experience in slush molding and rotocasting of plastics required, preferably some footwear experience. Also a working knowledge of injection molding and heat sealing would be beneficial. Excellent opportunity in connection with a department to manufacture a new line of products. Contact Mr. R. Hahn, Chief Engineer, O'Sullivan Rubber Corporation, Winchester, Virginia.

PRODUCT ENGINEER: Leading manufacturer of vacuum bottles and lunch kits has an important opening for a management-minded product engineer. We prefer an engineer who has knowledge and experience in the manufacture of light gauge steel, plastics, and aluminum products. He should be able to establish manufacturing specifications and tolerances and engineer research designs for high speed production. If you are interested in personal development, advancement, and long-range security and if you want a job where your accomplishments will show and will be rewarded, send resume of experience, expected salary, education, and references (previous employers preferred). All replies treated confidentially. Aladdin Industries, Incorporated, Box 7225, Nashville, Tennessee.

(Continued on page 264)

NO DICE



with

ESCAMBIA PVC dry blend resins

Eliminate the costly and time-consuming steps of milling, dicing and reworking material . . . yet, produce either rigid or flexible items of superior quality which are remarkably free of the imperfections normally found in dry blend extrusions. It's being done. Let us give you more information.



ESCAMBIA CHEMICAL CORPORATION

261 Madison Avenue

New York Telephone

New York 16, N. Y.

Oxford 7-4315

• ESCAMBIA is a trade mark of Escambia Chemical Corporation

(Continued from page 262)

PLASTICS APPLICATION ENGINEER: We are looking for a Chemical Engineer with 2 to 5 years experience in the application of thermoplastics. This position offers an opportunity to join the Research and Development Division of our progressive and growing company. Please send full details in confidence to: Personnel Director, Foster Grant Co., Inc., Leonminster, Mass.

AGGRESSIVE SALES organization offers concentrated coverage of the greater Chicago area for a quality product line. **CONTACT:** Mr. Lloyd Qually, c/o Application Engineering Corporation, 3811 Podlin Drive, Franklin Park, Illinois. Phone: POrter 6-5653. Many years experience engineering for production efficiency and economy in the plastics industry.

PLASTIC SALES ENGINEER: We are building an organization to commercialize the new plastics being developed by our research program. We need an effective and aggressive sales engineer to help introduce our materials to customers. Ability to work with product designers, plastic specialists, molders, extruders, and purchasing agents essential. Five to ten years experience with thermoplastics, their molding, extrusion, and fabrication desired. Preferably includes acrylic background. This is a position of major responsibility offering high challenge and excellent opportunity for a rewarding future. Sherman L. Tibbets, Personnel Manager, J. T. Baker Chemical Co., Phillipsburg, N. J.

Situations wanted

PLASTIC AND ORGANIC Chemical Sales: B.S. Chemical Engineering. Age 27. Five years successful, high volume industrial sales in the chemical industry. Good with new or rapidly growing products and ideas. Best references. Prefer commission basis in Chicago or New York area. Resume on request. Reply Box 6545, Modern Plastics.

MANUFACTURER'S REPRESENTATIVE: Seeking molding and extrusion lines. Covering all six New England States, calling on O.E.M. and industrial distributors. Technical knowledge of all thermosets and thermoplastics. Years of experience selling industrial plastics. Excellent sales record, complete knowledge of market. List materials processed, methods and if custom or standard products. Reply Box 6549, Modern Plastics.

CHEMICAL ENGINEER—12 years of product and process development experience in plastics and coating. Successfully handled broad responsibilities from the original concept through the laboratory, equipment design, production and sales. Thrives on problems and challenge. Age 34, family. Requires location within 50 miles of N.Y.C. Reply Box 6552, Modern Plastics.

EXPANDABLE POLYSTYRENE Engineer: 6 yrs. exp., complete plant set-up. Press, machine, multi-cavity mold design. Model exp. work; knowledge of piping and wiring for automatic presses; developer of colorfast dying. Also 10 yrs. exp. in vac. forming and fabricating of thermoplastics. Design and development exp. equiv. to engineer; no degree. Presently employed as designer and trouble shooter for 3 shift plant. Will relocate. Reply Box 6557, Modern Plastics.

CANADIAN SALES—Capable, experienced, successful in sales both U.S. and Canada. Thorough knowledge of thermosets and thermoplastics. Graduate M.E., registered professional engineer, family, age 31. Presently employed in Detroit area by one of the larger polypropylene producers. Canadian sales desired with base activities in Toronto. Reply Box 6562, Modern Plastics.

ENGINEER-PLANT MANAGER: 15 years technical experience. Mold design; estimating; development; job setup; production supervision. Desire compression and injection combined operation. Thrives on challenges; quick mold and tool deliveries; job cost reduction. Reply box 6564, Modern Plastics.

GENERAL MANAGER or Plant Manager: 37, BS, MBA, 17 years experience includes shop work, product and molding engineering, production control, purchasing, cost control, methods and systems analysis in the blow molding, injection, extrusion and rotation molding fields. Desirous of obtaining position with progressive organization. Reply Box 6565, Modern Plastics.

URETHANE FOAM SPECIALIST: Practical and theoretical experience all phases foam production-plant and machine design, formulations, testing production operation particularly ester and "one-shot" ether foams. Able to start-up, train personnel and maintain complete production operation. Seeking new top level connection with manufacturer and/or new material supplier. Reply Box 6568, Modern Plastics.

CHEMICAL ENGINEER: 34, twelve years diversified experience; thermoplastics calendering, extrusion, and laminating; industrial coatings formulating; elastomers. Strong background in product and process development, technical service, market development, sales promotion, production, administration. Patents. Currently employed AAAA Company in responsible supervisory position where opportunity is limited. Reply Box 6570, Modern Plastics.

SALES—SALES MANAGEMENT: Now employed. Ten years experience in flexible packaging sales. Includes Polyethylene, Cellophane and Coated Polyolefins for leading manufacturer. Responsible for \$1,000,000. sales annually. Desires challenging opportunity with reliable and fast moving manufacturer. West Coast location preferred. Possesses intelligence, integrity and energy. Presently located Midwest. Will relocate. Reply Box 6572, Modern Plastics.

PLANT SUPERINTENDENT: 22 years experience; plant set-up, mold designing, toolroom supervision injection molding, extrusion and blow molding. Desires to relocate with company where his know-how can be fully utilized. Reply Box 6575, Modern Plastics.

Miscellaneous

WANTED: Plastic Molding Operation. Injection, Phenolic or Fiberglas Molding. Outright purchase or part. Present management preferably retainable. Reply Box 6544, Modern Plastics.

PRODUCTION ITEM NEEDED: By Sandwich Panel Manufacturer. Contact: Kormac Panels direct, Grand Saline, Texas, or Box 10224, Dallas, Texas.

FOR EXPORT: Button dies and miscellaneous molding equipment available for export. Write Merit Plastics, 30 Lincoln Place, Lynbrook, N.Y.

SUCCESSFUL SALES ORGANIZATION Available for Exporters to Benelux. Here's a rare opportunity for someone seeking a distribution set-up in the Benelux area! For 12 years, with great success, our firm has represented one of the largest U.S. producers of plastic materials. Only because they are setting up their own organization, we will lose one of our major products. We are seeking new plastic and chemical lines. Excellent references. Offices in Brussels and Rotterdam. Write IMEXIN S.A., 5, Av. de Broqueville, 15, Brussels, Belgium.

COMPLETE METALLIZING plant for sale. Will set you up at great savings. Reply Box 6550, Modern Plastics.

SEEK CONTACT with those experienced in producing plastic denture material, and the moulding or manipulation of that material. Also, moulding of flexible Vinyl. Those interested to undertake production of a model of a gadget that would be prescribed by physicians. The gadget, a generic idea that has merit. A patentable idea. An unusual opportunity. Reply Box 6558, Modern Plastics.

FORMALDEHYDE: Technical Collaboration/Investment sought in India; guaranteed sale. Reply Box 6567, Modern Plastics.

LICENSE SOUGHT for the European market. I am looking for items that can be produced from P.V.C. by rotational or slush molding. If possible these items should be protected (patented) for the European market under a license arrangement or participation by American Companies in Germany. Reply Box 6571, Modern Plastics.

PLASTICS: If you are a volume user of injection molded parts with the usual quality, price and delivery problems, get in touch with me on how you may obtain a substantial interest in a profitable small molding company with little or no investment. We are very heavy in engineering and production know-how. Fast equipment. Location—Washington, D.C. Area. Reply Box 6573, Modern Plastics.

RATES FOR CLASSIFIED ADVERTISING

All classified advertisements payable in advance of publication

Closing date: 10th of preceding month, e.g., July 10th for August issue
Per inch (or fraction) .. \$30.00; each 3 inches or fraction (in border) \$15.00 extra

Situations Wanted Ads ... 1/3 of above rates

For purpose of establishing rate, figure approximately 50-55 words per inch. For further information address Classified Advertising Department, Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y. Modern Plastics reserves the right to accept, reject or censor classified copy.



REAR HOUSING for PORTABLE TV
Precision Molded by SINKO

Of impact-resistant Marlex . . . a typical example of Sinko engineering know-how and skill. Parts such as this are being economically produced in the many thousands per day in our large, modern, fully equipped plant.

Let us bid on your next Plastic Molding job!

WE MOLD ALL THERMOPLASTICS . . . from 2 to 175 oz.

Sinko

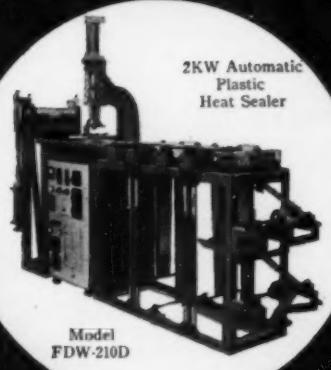
MANUFACTURING and TOOL CO.

7310 W. WILSON AVE. - CHICAGO 45

Offices in Principal Cities Throughout the United States

Operates completely automatically or manually!

FUJI



Most Convenient & Highly Efficient . . .
 HIGH FREQUENCY WELDER

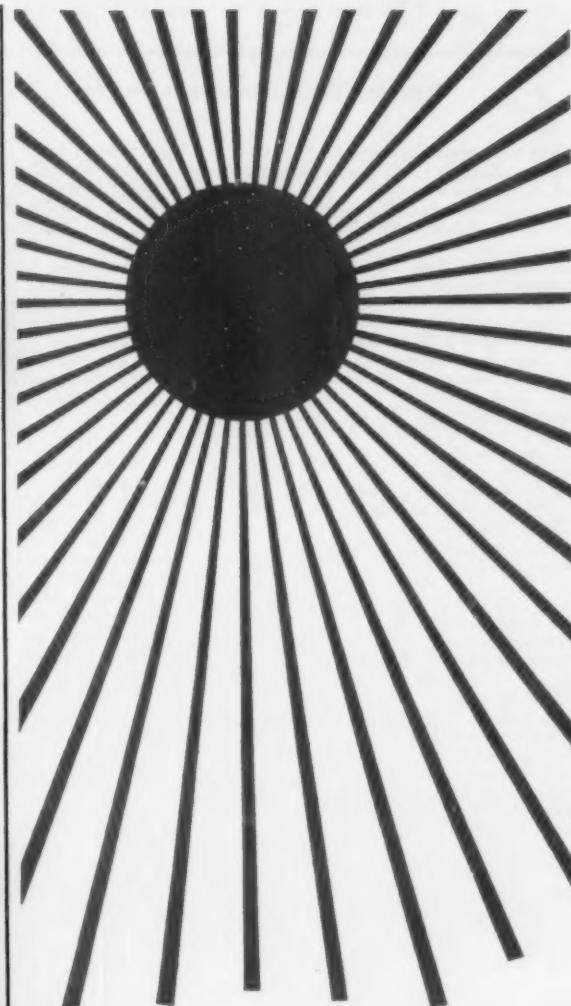
This Heat Sealer is workable either automatically or manually. In the former, a definite operational cycle is followed due to complete interlocking of the press, generator and indexer. In the latter, the cycle is broken down into its respective components.

Other Lines

Preheaters & Instruments

FUJI ELECTRONIC INDUSTRIAL CO., INC.

46 Minami-cho, Itabashi-ku, Tokyo, Japan
 Cable Address: "ELCOFUJI TOKYO"



**MERCURY-CADMIUM
 REDS
 LITHOPONES - TONERS**

**SUPERIOR DISPERSION
 EASY DRY-COLORING**

WRITE FOR SAMPLES AND BULLETIN 29, COLOR CARD

Kentucky Color
 AND CHEMICAL COMPANY

Division of THE HARSHAW CHEMICAL COMPANY, LOUISVILLE, KENTUCKY

INDEX OF ADVERTISERS

Distribution of this issue: 35,700

Acheson Dispersed Pigments Co.	223
Acromark Company, The	248
Adamson United Company	256
Advance Solvents & Chemical, Div. of Carlisle Chemical Works, Inc.	75
Allied Chemical Corp., National Aniline Div.	152
Plastics & Coal Chem. Div.	123-126
Semet-Solvay Petrochemical Div.	133
Alpha Chemical & Plastics Corp.	243
Alva Allen Industries	237
American Cyanamid Company, Dyes Dept.	53
Plastics Div.	199
Plastics & Resins Div.	138
Apex Machine Co.	247
Archer-Daniels-Midland	217
Argus Chemical Corporation	61
Atlas Electric Devices Co.	177
Auto-Vac Company A Div. of National Cleveland Corp.	244
B.I.P. Engineering Ltd.	238
BX Plastics Ltd.	176A
Badische Anilin- & Soda-Fabrik AG.	192F
Ball & Jewell, Inc.	6
Barber-Colman Company, Wheelco Instruments	225
Battenfeld Machines	36, 37
Bellows-Valvair	240
Berkshire County Industrial Development Comm.	64
Bermer Tool & Die, Inc.	236
Borden Chemical Co., The	59
Borg-Warner, Marbon Chemical Div.	85
Brabender, C. W. Instruments, Inc.	239
British Oxygen Chemicals Ltd.	192H
British Resin Products Ltd.	176B
Brown Machine Co.	196
Cadet Chemical Corp.	183
Cadillac Plastic and Chemical Co.	7
Carver, Fred S., Inc.	189
Cary Chemicals Inc.	179
Catalin Corp. of America	1
Celanese Corp. of America, Plastics Div.	9
Chemore Corporation	171
Chemical Products Corp.	189
Chemische Werke Hüls	192A
Chicago Molded Products Corp.	42
Ciba Company, Inc.	143, 144
Claremont Flock Corp.	193
Clark, Cutler, McDermott Co.	81
Classified	260
Commercial Decal	8
Conforming Matrix Corp.	185
Consolidated Vacuum	232
Continental Oil Company, Petrochemical Dept.	203
Covema s.r.l.	255
Cumberland Engineering Company, Inc.	4
Dake Corporation	182
Daubert Chemical Company	215
Davis, Joseph, Plastics Co.	14
Decoy Products Co.	204
De Mattia Machine & Tool Co.	141
Diamond Alkali Company, Chlorinated Products Div.	131
Plastics Div.	121
DuPont de Nemours, E. I. & Co. (Inc.) Explosives Dept.	10, 11

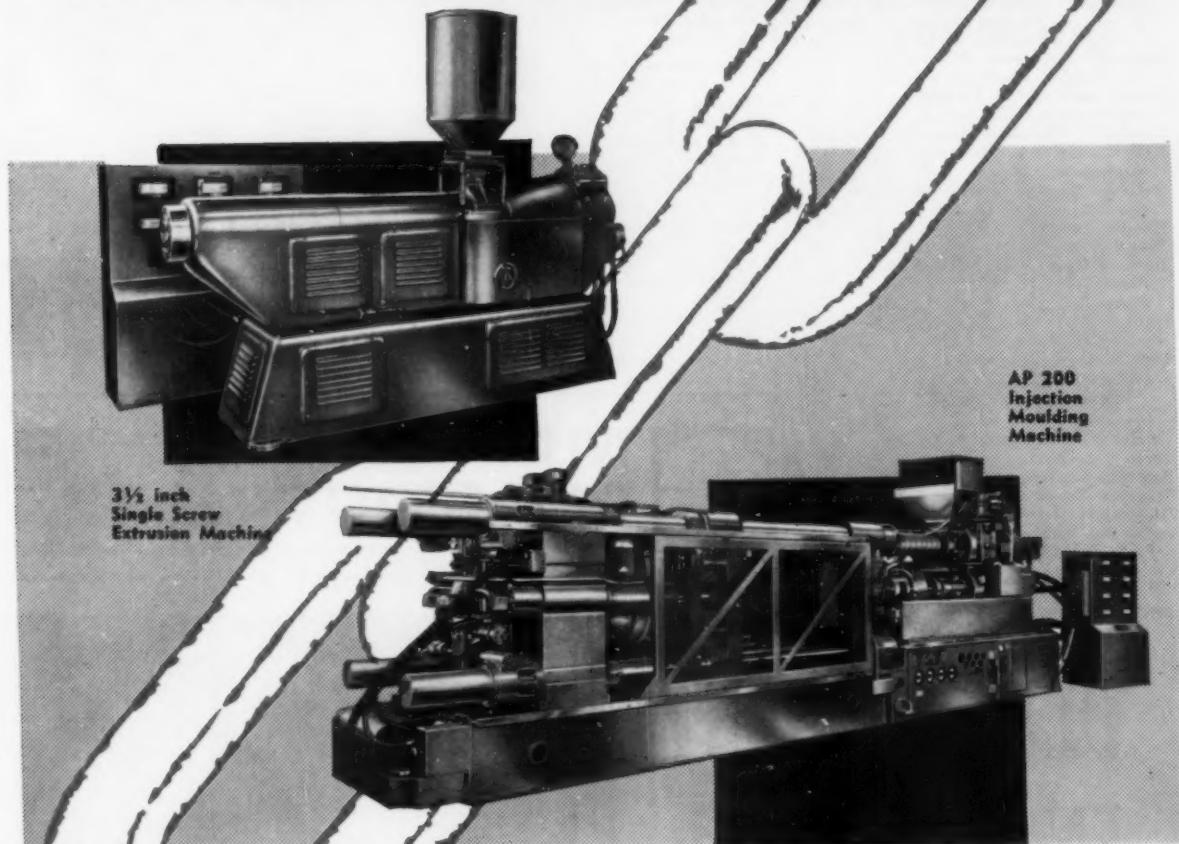
Durez Plastics Div., Hooker Chemical Corp.	Inside Front Cover
Eastman Chemical Products, Inc.	119, 129
Egan, Frank W., & Co.	165
Emery Industries, Inc., Organic Chemical Sales Dept.	86
Enjay Chemical Company A Division of Humble Oil & Refining Co.	259
Erinoid Limited	192D
Escambia Chemical Corp.	263
Essex Plastic Machinery Co., Inc.	228
Fabricon Products, A Div. of the Eagle Picher Co.	167
Fairhaven Properties Corp.	25
Farbwerke Hoechst AG	176C
Fellows Gear Shaper Co., The Plastics Machine Division	62, 63
Ferro Corporation, Color Div.	194
Fine Organics, Inc.	168
Fischer, Johann, Maschinenfabrik	191
Flightex Fabrics, Inc.	69
Food Machinery and Chemical Corp., Dapon Dept.	79
Epoxy Dept.	229
Foster Grant Co., Inc.	32, 33, 268
French Oil Mill Machinery Co., The, Hydraulic Press Div.	248
Fritzsche Brothers, Inc.	212
Fuji Electronic Industrial Co., Inc.	265
G-W Plastic Engineers, Inc.	177
Geigy, J. R.	222A, B
General Dyestuff Company, Pigment Dept.	77
General Electric Co.	268
General Public Utilities Corp.	184
General Roll Leaf Manufacturing Co.	231
General Tire & Rubber Co., The Chemical Division	44
Gering Plastics, Div. of Studebaker- Packard Corp.	17
Glidden Co., The, Industrial Paint Div.	38
Goodrich, B. F., Chemical Co.	5
Goodyear Tire & Rubber Co., The, Chemical Div.	13
Grace, W. R., & Co., Polymer Chemicals Div.	210, 211
Grieve-Hendry Co.	188
Haller, Inc.	248
Harchem Div., Wallace & Tiernan, Inc.	200
Harshaw Chemical Co., The	205
Heinrich Equipment Corp., Reifenhauser KG	20
Hercules Powder Company, Inc., Cellulose and Plastics Div.	146, 147
Hooker Chemical Corp., Durez Plastics Div.	Inside Front Cover
Houdry Process Corp.	82
Hyde, A. L., Co.	246
Hydraulic Press Mfg. Co., The A Division of Koehring Co.	21
Imperial Chemical Industries Ltd., Plastics Division	34
Improved Machinery Inc.	209

JUNE 1960

Industrial Research Laboratories	185
Injection Molders Supply Co.	212
Interchemical Corp., Finishes Division	74
Jefferson Chemical Co., Inc.	245
Kato Seisakusho Co., Ltd.	169
Kaumagraph Co.	247
Kay Machine Co., Inc.	241
Kentucky Color and Chemical Co.	265
Kessler Chemical Co., Inc.	236
Koppers Company, Inc., Plastics Div.	181
Krauss-Maffei	221
La Rose, W. T., & Assoc., Inc.	192
Lebo Machine Works, Inc.	84
Lester-Phoenix, Inc.	31
Liberty Machine Co., Inc.	208
Lucidol Div., Wallace & Tiernan, Inc.	226
Marbon Chemical Div., Borg-Warner	85
Markem Machine Co.	190
Mearl Corporation, The	180
Meiki Co., Ltd.	76
Metalsmiths	188
Midland-Ross Corp., Waldron-Hartig Div.	258
Modern Plastic Machinery Corp.	18
Monsanto Chemical Co., Organic Chemicals Div.	112, 113
Plastics Div.	219
Moslo Machinery Company	173
Motch and Merryweather, Cutting Tool Mfg. Div.	169
Mount Vernon Mills, Inc.	174
Muehlstein, H., & Co., Inc.	19
National Aniline Div., Allied Chemical Corp.	152
National Automatic Tool Co., Inc., Plastics Machinery Div.	27
National Lead Company	227
National Research Equipment Corporation	235
National Rubber Machinery Co.	83
Negri Bossi & C.	161
Netstal Machine Factory and Foundry Ltd.	192E
Newbury Industries, Inc.	35
New England Butt Co.	155
Nuodex Products Company	163
Olsenmark Corporation	228
Orange Products, Inc.	241
Ornapress A.G.	39
Oronite Chemical Company	261
Package Machinery Co., Reed- Prentice Div.	15
Paterson Parchment Paper Co.	206
Peco Machinery Sales (Westminster) Ltd.	192G
Pee Cee Tape & Label Co.	26
Peerless Roll Leaf Co., Div. of Howe Sound Co.	233
Perforated Specialties Co., Inc.	188
Peter Partition Corp.	213
Phillips Chemical Co.	29

(Continued on page 268)

the Link Between **PLASTICS . . .**



3 1/2 inch
Single Screw
Extrusion Machine

AP 200
Injection
Moulding
Machine

... & PROFITS



*The Windsor range includes
Injection Moulding Ma-
chines in capacities from 1
to 210 ozs and Extrusion
Machines with outputs up to
450 lb per hour.*

WINDSOR

PLASTICS MACHINERY . . .

is the essential link in the chain of production processes
—a strong link—forged by unsurpassed experience, knowledge
and engineering craftsmanship—and coupled to a
reputation for technical perfection that has no equal,
anywhere in the world.

Sales and Service

R. H. WINDSOR OF CANADA LTD.

56 Advance Rd., Toronto 18, Ontario, Canada. Tel: BELMONT 2-2971.

Grams & Cables: **WINPLAS, TORONTO, CANADA**

Head Office: LEATHERHEAD ROAD, CHESSINGTON, SURREY, ENGLAND.

R.H.
Windsor LTD.



(Continued from page 266)

Pittsburgh Coke & Chemical Co.	
Industrial Chemical Div.	
Inside Back Cover	
Plastics Engineering Co.	23
Powell Pressed Steel Co., The	28
Prodex Corporation	50, 51
Progressive Tool & Die Co.	237
Quinn-Berry Corp.	16
Raybestos-Manhattan, Inc.	251
Recto Molded Products, Inc.	247
Reed-Prentice Div., Package	
Machinery Co.	15
Reichhold Chemicals, Inc.	57
Reifenhauser KG, Heinrich	
Equipment Corp.	20
Reliance Electric and Engineering	
Co.	197
Rhodia Inc.	187
Riegel Paper Corp.	80
Rohm & Haas Co.,	
Plastics Div.	159
Resinous Products Div.	195
Rona Laboratories, Inc.	169
Ross, Chas. & Son Co., Inc.	204
Rubber Corp. of America	230
Rudolph, Martin	253
Sandee Manufacturing Company	231
Surco Co., Inc.	231
Schwartz Chemical Co., Inc.	250
Scranton Plastic Laminating Corp.	162
Sealamatic Electronics Corp.	78
Seiberling Rubber Co.,	
Plastics Division	175

Semet-Solvay Petrochemical Div.,	
Allied Chemical Corp.	133
Shaw, Frances, & Co., Ltd.	30
Shell Chemical Co.,	
Plastics and Resins Div.	40
Siempelkamp, G. & Co.	70
Simon-Carter Co.	207
Sinko Mfg. and Tool Co.	265
Societe du Verre Textile	176D
Spencer Chemical Co.	24
Standard Tool Co.	249
Sta-Warm Electric Co.	213
Stokes, F. J., Corp.	
Plastics Equipment Div.	136, 137
Stowe-Woodward, Inc.	186
Taylor-Emmett Controls, Inc.	
a sub. of Taylor Instrument Co.	234
Thermel, Inc.	239
Thoreson-McCosh, Inc.	237
Titanium Pigment Corporation	46
Triulzi, S. A. S.	192B, 192C
Tumb-L-Matic, Inc.	185
Union Carbide Corp.	
Union Carbide International Co.,	
Div.	254A, B
Union Carbide Plastics Co.,	
Div.	72-73, 242
U. S. Industrial Chemicals Co.,	
Div. of National Distillers and	
Chemical Corp.	65-68
U. S. Rubber Company	
Naugatuck Chemical Div.	
Kralastic	157
Tonox Div.	243
Vibrin	149
U. S. Stoneware	269
Van Dorn Iron Works Co., The	49
Verona Dyestuffs	254
Wallace & Tiernan, Inc.	
Harchem Div.	200
Lucidol Div.	226
Watlow Electric Mfg. Co.	178
Welding Engineers, Inc.	114
Wellington Sears Co.	12
Werner & Pfeiderer Corp.	176
Westchester Plastics, Inc.	71
Weston Instruments Div.,	
Daystrom Inc.	246
Wheelock Instruments Div.	
Barber-Colman Corp.	225
Wiegand, Edwin L., Co.	22
Wilcox Products Co.	193
Williams, C. K., & Co.	208
Windsor, R. H., Ltd.	267
Witco Chemical Company, Inc.	151
Woloch, George, Co., Inc.	257
Wood, R. D., Company	55
Wyandotte Chemicals Corp.	
Michigan Alkali Div.	198



MODERN PLASTICS

PUBLISHED BY BRESKIN PUBLICATIONS INC. 575 Madison Avenue, New York 22, N. Y.



DEVELOPMENT ENGINEER

With heavy experience in machine design to head projects related to plastic extrusion, molding and forming.

Realize all the advantages that this medium-sized leader in the plastics industry can offer: individual recognition, excellent growth potential, maximum compensation and benefits, and delightful Massachusetts location.

Please send full details in confidence to:
Personnel Director

FOSTER GRANT CO., INC.

Leominster, Massachusetts



PRECISE COLOR BUILDS PROFITS

If your plant processes large amounts of colored materials, you can minimize color control problems and save thousands of dollars each year by investing in a General Electric Recording Spectrophotometer. This instrument defines color differences—specifies standards—determines formulations—with unequalled accuracy and sensitivity. Versatile and dependable, it is used throughout the world in laboratories, factories . . . wherever precision color measurement means savings.

Get the full story—just contact your nearest G-E Apparatus Sales Office or write for Bulletin GEZ-3031, General Electric Company, Section 598-12A, Schenectady 5, N. Y.

INSTRUMENT DEPARTMENT

GENERAL ELECTRIC

"U. S." HEAVY-DUTY DRUM TUMBLERS

**for Faster, Easier
Dry Color Mixing
and Compounding**



You can save time . . . cut costs . . . speed production by tumble mixing colorants and molding materials right in their shipping drums. "U. S." Drum Tumblers are designed to do the job quicker, easier, more effectively.

These precision-built machines have sturdy welded construction for long life and trouble-free service. Their rugged steel bases provide rigid support for handling unbalanced loads. Positive roller chain drives, extra powerful motors and heavy-duty ball bearings assure smooth tumbling action under heavy loads.

Only "U. S." Drum Tumblers offer such extra ease of operation. Custom-built to meet specific mixing requirements, they are available with typical features shown at left — "floor-level" loading for quicker, easier drum handling; built-in drum extenders, providing extra space for thorough mixing of full drum loads; quick-acting toggle clamps for rapid opening or closing in one easy motion; adjustable drum holders to handle various size drums.

"U. S." Drum Tumblers are built in a range of sizes to handle standard fiber or metal drums; with motors of $\frac{3}{4}$, 1, 2, 3, and 5 h.p.; capacities from 250 to 500 lbs. per drum. Our Engineering Service Department will gladly recommend the proper unit to meet your specific mixing requirements. Write today for complete details.

PROCESS EQUIPMENT DIVISION





EDITORIAL

Chaos in dinnerware

In a field in which there is good demand for quality products, and for which there is an obviously fabulous future—melamine dinnerware—it is amazing to watch pricing policies that can only result in loss of prestige and profit.

More amazing is the fact that the cut-price condition is being generated within the molding industry itself.

The whole success of melamine tableware, to date, has been based on better-than-standards quality. Price cuts for volume purposes can lead only to lower quality products. This, in turn, can lead only to loss of distributor and public goodwill and to lower profits. Again, this would mean that less money would be available from profits for sales expansion, for promotion, and more important, for development and research directed toward still better quality.

With the big new developments in decorating methods, as outlined in this issue (pp. 87-91), with new opportunity to compete with other materials in beauty and quality, with a constantly expandable market, we are convinced that those in the melamine dinnerware field should take thought to pricing policies now, before chaos is compounded to the financial and market loss of their whole industry.

This sore condition, in one segment of the plastics industries, if allowed to fester further, causing public dissatisfaction through the lowering of dinnerware quality, can affect every other segment of the plastics industries and can bring loss of prestige and profits to the whole industry.

The price-cutter has always been with us in all industries. To allow him to dictate or even to influence marketing policies—policies which can only snowball into disaster—is absurd.

A clarification

Because of possible confusion arising from similarities between company names and the name of this publication, the management states that neither MODERN PLASTICS magazine nor any of its employees has any proprietary interest, financial or otherwise, in any company engaged in any phase of the plastics business itself.

In those instances wherein any company has chanced to use the name MODERN PLASTICS or any similar words in its company name, it was not with our consent nor are we able to withhold such consent except as it applies to a publication.

One of the reasons for this clarification is that for 33 years we have taken great pains to build a national and international reputation for our name and for MODERN PLASTICS as a publication. Our purpose as a company is solely devoted to the broad interests of the plastics field and to the informational and educational job that MODERN PLASTICS magazine performs.

Chairman of the board

Charles A. Breskin

President and publisher

Alan S. Cole

Editor

Hiram McCann

Managing editor

Sidney Gross

Frank Murray, assistant

Senior editors

R. L. Van Boskirk

A. Paul Peck

Technical editor

Dr. Gordon M. Kline

Engineering editor

George R. Smoluk

Engineering consultant

Dr. James F. Carley

Feature editor

Joel Frados

Associate editor

Guy Bishop

Midwestern editor

Val Wright

Assistant editors

Robert H. Ingham

Janet Giardina

Readers service

Eve H. Marcus

Art director

Donald R. Ruther

Production

Daniel M. Broads, director

Verna Retzlaff, assistant

Vivian Sansom

Harry Baron

Treasurer

Beatrice Grove

Circulation

Robert B. Birnbaum, director

George Leiz, subscription mgr.

Promotion

Warren S. Langer, manager

Business staff

New York 22, 575 Madison Ave.

Tel., PLaza 9-2710

Stuart S. Siegel, manager

Perry H. Backstrom

Philip W. Muller

Robert C. Nilson

Benjamin R. Stanton

Theodore B. Breskin

Michael J. Stoller

Bevin Smith

Jack M. Post

Chicago 11, 620 N. Michigan Ave.

Tel., DElaware 7-0060

James M. Connors, vice-president

William F. Kennedy

Thomas O. McDonough

John Wemple

Cleveland 20, 3537 Lee Rd.

Tel., SKYline 1-6200

Robert C. Beggs, manager

Richard Rogers

Los Angeles 48, 6535 Wilshire Blvd.

Tel., OLive 3-3223

James C. Galloway

Atlanta 3, 1722 Rhodes Haverty Bldg.

Tel., JACKson 2-8113

Gene Krimmier

London E. C. 4, England

29 New Bridge St.

Tel., CITY 3049

Howard Williams

Frankfurt am Main, Germany

Wittelsbacher Allee 60

Tel., 46 143/46 372

Georg J. Linder



Pittsburgh Chemicals News



In Missile Components, too, Nothing Does The Job Like Polyesters!

The use of glass reinforced polyester plastics in missile and rocket components presents a real challenge to the plastics industry. That's why a growing number of resin manufacturers rely on Pittsburgh Chemical for dependable supplies of high purity maleic anhydride, phthalic anhydride and fumaric acid—three key intermediates used in the production of polyester resins.

The Airforce Boeing Bomarc interceptor, which attacks oncoming aircraft at almost three times the speed of sound, has a Radome made of glass-reinforced polyester plastic. Polyester plastics provide the combination of light weight, high strength, heat-resistance and transparency to radar beams demanded by Bomarc designers.

If you make polyester resins, you'll save time and money buying "all three" intermediates from

Pittsburgh. Paper work and shipping costs can be reduced—and you'll be dealing with one efficient, coordinated sales and technical service team, anxious to meet your delivery requirements and help reduce your processing costs. Call Pittsburgh for your next shipment of intermediates!

1098

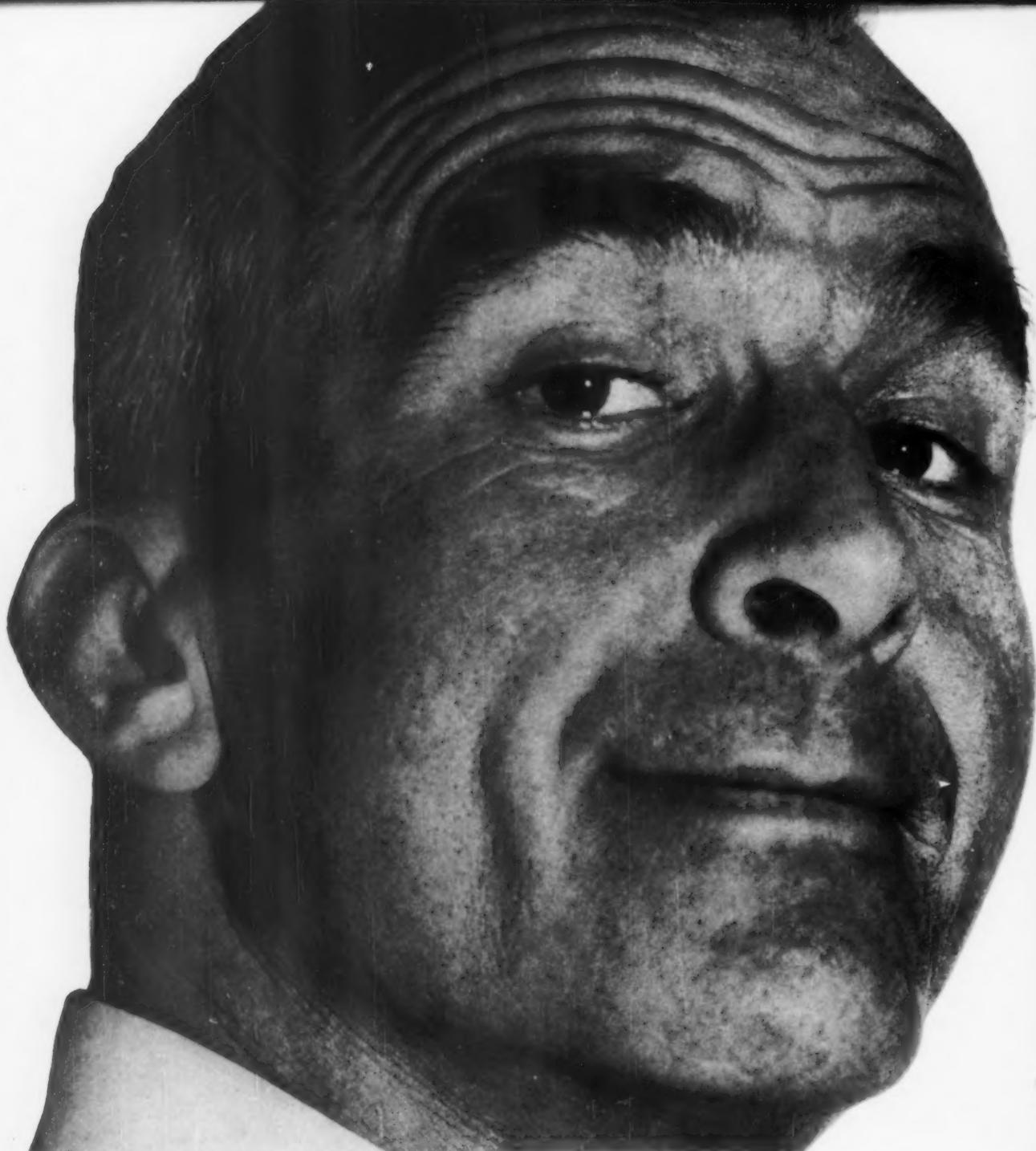
INDUSTRIAL CHEMICALS DIVISION



**PITTSBURGH
CHEMICAL CO.**

GRANT BUILDING PITTSBURGH 19, PA.

A Subsidiary of PITTSBURGH COKE & CHEMICAL CO.



message for a molder from Missouri

This man has heard of the G-E Value Concept; we've talked about it in our phenolics advertising for a long time now. But this man is wary of slogans. He wants to be shown. Fair enough. "And what's in it for me?" he asks. Fair question.

The G-E Value Concept holds that phenolics offer molders and end-users properties that are unequaled by any other plastic material. No other plastic has the combination of heat resistance, dimensional stability and rigidity that phenolics provide.

All right, but why G-E phenolics? Where is the extra value there? In the first place, G-E compounds are top-quality and that quality is closely controlled. We make a broad line of phenolics. That means one source, one responsibility.

General Electric is research-minded. Through the development of new mold-

*Phenolics-first of the modern
plastics...first in value*

GENERAL ELECTRIC

ing powders and better processing techniques, we create new profit opportunities for molders, a wider choice of properties for designers.

Finally, G-E technical service helps molders find the right compound for each job, then helps them get the job into profitable production.

That's the G-E Value Concept of phenolics. Molders from Missouri (or elsewhere) can see it in action by writing General Electric Company, Section MP-60, Chemical Materials Department, Pittsfield, Massachusetts.

